TRI-SUBSTITUTED HETEROARYLS AND METHODS OF MAKING AND USING THE SAME

BACKGROUND OF THE INVENTION

TGFβ (Transforming Growth Factor β) is a member of a large family of dimeric polypeptide growth factors that includes, for example, activins, inhibins, bone morphogenetic proteins (BMPs), growth and differentiation factors (GDFs) and mullerian inhibiting substance (MIS). TGFβ exists in three isoforms (TGFβ1, TGFβ2, and TGFβ3) and is present in most cells, along with its receptors. Each isoform is expressed in both a tissue-specific and developmentally regulated fashion. Each TGFβ isoform is synthesized as a precursor protein that is cleaved intracellularly into a C-terminal region (latency associated peptide (LAP)) and an N-terminal region known as mature or active TGFβ. LAP is typically non-covalently associated with mature TGFβ prior to secretion from the cell. The LAP- TGFβ complex cannot bind to the TGFβ receptors and is not biologically active. TGFβ is generally released (and activated) from the complex by a variety of mechanisms including, for example, interaction with thrombospondin-1 or plasmin.

Following activation, TGFβ binds at high affinity to the type II receptor (TGFβRII), a constitutively active serine/threonine kinase. The ligand-bound type II receptor phosphorylates the TGFβ type I receptor (Alk 5) in a glycine/serine rich domain, which allows the type I receptor to recruit and phosphorylate downstream signaling molecules, Smad2 or Smad3. See, e.g., Huse, M. et al., *Mol. Cell.* 8: 671-682 (2001). Phosphorylated Smad2 or Smad3 can then complex with Smad4, and the entire hetero-Smad complex translocates to the nucleus and regulates transcription of various TGFβ-responsive genes. See, e.g., Massagué, J. *Ann. Rev .Biochem. Med.* 67: 773 (1998).

Activins are also members of the TGFβ superfamily, which are distinct from TGFβ in that they are homo- or heterodimers of activin βa or βb. Activins signal in a manner similar to TGFβ , that is, by binding to a constitutive serine-threonine receptor kinase, activin type II receptor (ActRIIB), and activating a type I serine-threonine receptor, Alk 4, to phosphorylate Smad2 or Smad3. The consequent formation of a hetero-Smad complex with Smad4 also results in the activin-induced regulation of gene transcription.

Indeed, TGFβ and related factors such as activin regulate a large array of cellular processes, e.g., cell cycle arrest in epithelial and hematopoietic cells, control of

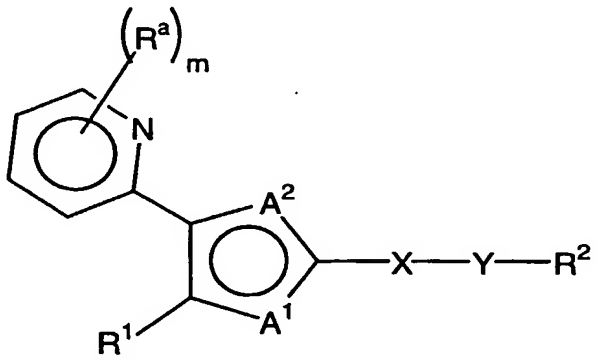
mesenchymal cell proliferation and differentiation, inflammatory cell recruitment, immunosuppression, wound healing, and extracellular matrix production. See, e.g., Massagué, J. *Ann. Rev .Cell. Biol.* 6: 594-641 (1990); Roberts, A. B. and Sporn M. B. *Peptide Growth Factors and Their Receptors,* 95: 419-472 Berlin: Springer-Verlag (1990); Roberts, A. B. and Sporn M. B. *Growth Factors* 8:1-9 (1993); and Alexandrow, M. G., Moses, H. L. *Cancer Res.* 55: 1452-1457 (1995). Hyperactivity of TGFβ signaling pathway underlies many human disorders (e.g., excess deposition of extracellular matrix, an abnormally high level of inflammatory responses, fibrotic disorders, and progressive cancers). Similarly, activin signaling and overexpression of activin is linked to pathological disorders that involve extracellular matrix accumulation and fibrosis (see, e.g., Matsuse, T. et al., *Am. J. Respir. Cell Mol. Biol.* 13: 17-24 (1995); Inoue, S. et al., *Biochem. Biophys. Res. Comm.* 205: 441-448 (1994); Matsuse, T. et al, *Am. J. Pathol.* 148: 707-713 (1996); De Bleser et al., *Hepatology* 26: 905-912 (1997); Pawlowski, J.E., et al., *J. Clin. Invest.* 100: 639-648 (1997); Sugiyama, M. et al., *Gastroenterology* 114: 550-558 (1998); Munz, B. et al., *EMBO J.* 18: 5205-5215 (1999)), inflammatory responses (see, e.g., Rosendahl, A. et al., *Am. J. Repir. Cell Mol. Biol.* 25: 60-68 (2001)), cachexia or wasting (see Matzuk, M. M. et al., *Proc. Nat. Acad. Sci. USA* 91: 8817-8821 (1994); Coerver, K.A. et al, *Mol. Endocrinol.* 10: 534-543 (1996); Cipriano, S.C. et al. *Endocrinology* 141: 2319-27 (2000)), diseases of or pathological responses in the central nervous system (see Logan, A. et al. *Eur. J. Neurosci.* 11: 2367-2374 (1999); Logan, A. et al. *Exp. Neurol.* 159: 504-510 (1999); Masliah, E. et al., *Neurochem. Int.* 39: 393-400 (2001); De Groot, C. J. A. et al, *J. Neuropathol. Exp. Neurol.* 58: 174-187 (1999), John, G. R. et al, *Nat Med.* 8: 1115-21 (2002)) and hypertension (see Dahly, A. J. et al., *Am. J. Physiol. Regul. Integr. Comp. Physiol.* 283: R757-67 (2002)). Studies have shown that TGFβ and activin can act synergistically to induce extracellular matrix production (see, e.g., Sugiyama, M. et al., *Gastroenterology* 114: 550-558, (1998)). It is therefore desirable to develop modulators (e.g., antagonists) to members of the TGFβ family to prevent and/or treat disorders involving this signaling pathway.

SUMMARY OF THE INVENTION

The invention is based on the discovery that compounds of formula (I) are unexpectedly potent antagonists of the TGFβ family type I receptors, Alk5 and/or Alk 4.

Thus, compounds of formula (I) can be employed in the prevention and/or treatment of diseases such as fibrosis (e.g., renal fibrosis, pulmonary fibrosis, and hepatic fibrosis), progressive cancers, or other diseases for which reduction of TGFβ family signaling activity is desirable.

In one aspect, the invention features a compound of formula I:



(I)

R^1 can be aryl, heteroaryl, aralkyl, or heteroaralkyl. Each R^a can be independently alkyl, alkenyl, alkynyl, alkoxy, acyl, halo, hydroxy, amino, nitro, oxo, thioxo, cyano, guanadino, amidino, carboxy, sulfo, mercapto, alkylsulfanyl, alkylsulfinyl, alkylsulfonyl, aminocarbonyl, alkylcarbonylamino, alkylsulfonylamino, alkoxycarbonyl, alkylcarbonyloxy, urea, thiourea, sulfamoyl, sulfamide, carbamoyl, cycloalkyl, cycloalkyloxy, cycloalkylsulfanyl, heterocycloalkyl, heterocycloalkyloxy, heterocycloalkylsulfanyl, aryl, aryloxy, arylsulfanyl, aroyl, heteroaryl, heteroaryloxy, heteroarylsulfanyl, or heteroaroyl. X can be cycloalkyl or heterocycloalkyl. Y can be a bond, -C(O)-, -C(O)-O-, -O-C(O)-, -$S(O)_p$-O-, -O-$S(O)_p$-, -C(O)-$N(R^b)$-, -$N(R^b)$-C(O)-, -O-C(O)-$N(R^b)$-, -$N(R^b)$-C(O)-O-, -O-$S(O)_p$-$N(R^b)$-, -$N(R^b)$- $S(O)_p$-O-, -$N(R^b)$-C(O)-$N(R^c)$-, -$N(R^b)$-$S(O)_p$-$N(R^c)$-, -C(O)-$N(R^b)$-$S(O)_p$-, -$S(O)_p$-$N(R^b)$-C(O)-, -C(O)-$N(R^b)$-$S(O)_p$-$N(R^c)$-, -C(O)-O-$S(O)_p$-$N(R^b)$-, -$N(R^b)$-$S(O)_p$-$N(R^c)$-C(O)-, -$N(R^b)$-$S(O)_p$-O-C(O)-, -$S(O)_p$-$N(R^b)$-, -$N(R^b)$-$S(O)_p$-, -$N(R^b)$-, -$S(O)_p$-, -O-, -S-, or -$(C(R^b)(R^c))_q$-, wherein each of R^b and R^c is independently hydrogen, hydroxy, alkyl, alkoxy, amino, aryl, aralkyl, heterocycloalkyl, heteroaryl, or heteroaralkyl. p can be 1 or 2, and q can be 1-4. R^2 can be hydrogen, alkyl, alkenyl, alkynyl, cycloalkyl, (cycloalkyl)alkyl, cycloalkenyl, (cycloalkenyl)alkyl, aryl, aralkyl, arylalkenyl, heterocycloalkyl, (heterocycloalkyl)alkyl, heterocycloalkenyl, (heterocycloalkenyl)alkyl, heteroaryl, heteroaralkyl, or (heteroaryl)alkenyl. Each of A^1 and A^2, independently, can be O, S, N, or NR^b; provided

that at least one of A^1 and A^2 can be N. m can be 0, 1, 2, or 3, i.e., the 2-pyridyl ring can be unsubstituted or substituted with 1-3 R^a groups. Note that when $m \geq 2$, two adjacent R^a groups can join together to form a 4- to 8-membered optionally substituted cyclic moiety. That is, the 2-pyridyl ring can fuse with a cyclic moiety to form a moiety, e.g., 7H-[2]pyrindinyl, 6,7-dihydro-5H-[1]pyrindinyl, 5,6,7,8-tetrahydro-quinolinyl, 5,7-dihydro-furo[3,4-b]pyridinyl, or 3,4-dihydro-1H-thiopyrano[4,3-c]pyridinyl, that can be optionally substituted with one or more substituents such as alkyl (including carboxyalkyl, hydroxyalkyl, and haloalkyl such as trifluoromethyl), alkenyl, alkynyl, cycloalkyl, heterocycloalkyl, alkoxy, aryl, heteroaryl, aryloxy, heteroaryloxy, aroyl, heteroaroyl, amino, nitro, carboxy, alkoxycarbonyl, alkylcarbonyloxy, aminocarbonyl, alkylcarbonylamino, cyano, halo, hydroxy, acyl, mercapto, alkylthio, sulfoxy, sulfamoyl, oxo, or carbamoyl.

In an embodiment, X can be a 4- to 8-membered monocyclic cycloalkyl or heterocycloalkyl, or X can be a 4- to 8-membered bicyclic cycloalkyl or heterocycloalkyl. For example, X can be cyclohexyl, cyclopentyl, piperidinyl, piperazinyl, pyrrolidinyl, tetrahydrofuran, bicyclo[2.2.1]heptane, bicyclo[2.2.2]octane, bicyclo[3.2.1]octane, 2-oxa-bicyclo[2.2.2]octane, 2-aza-bicyclo[2.2.2]octane, 3-aza-bicyclo[3.2.1]octane, or 1-aza-bicyclo[2.2.2]octane.

In an embodiment, X can be piperidinyl, piperazinyl, or pyrrolidinyl; each of which can be bonded to moiety Y via its nitrogen ring atom; and Y can be a bond, -C(O)O-, -C(O)-N(R^b)-, -S(O)$_2$-, or -S(O)$_2$-N(R^b)-, wherein R^b can be hydrogen or C_{1-4} alkyl.

In an embodiment, X can be cyclohexyl, cyclopentyl, or bicyclo[2.2.2]octane; and Y can be -N(R^b)-C(O)-, -N(R^b)-S(O)$_2$-, -C(O)-, -C(O)-O-, -O-C(O)-, -C(O)-N(R^b)-, -S(O)$_p$-, -O-, -S(O)$_2$-N(R^b)-, - N(R^b)-, -N(R^b)-C(O)-O-, -N(R^b)-C(O)-N(R^c)-, -C(O)-N(R^b)-S(O)$_p$-N(R^c)-, or -C(O)-O-S(O)$_p$-N(R^b)-. Each of R^b , R^c, and p has been defined above.

In an embodiment, Y can be -N(R^b)-C(O)-, -N(R^b)-S(O)$_2$-, -C(O)-, -C(O)-O-, -O-C(O)-, -C(O)-N(R^b)-, -S(O)$_p$-, -O-, -S(O)$_2$-N(R^b)-, - N(R^b)-, -N(R^b)-C(O)-O-, -N(R^b)-C(O)-N(R^c)-, -C(O)-N(R^b)-S(O)$_p$-N(R^c)-, or -C(O)-O-S(O)$_p$-N(R^b)-. Each of R^b , R^c, and p has been defined above.

In an embodiment, R^2 can be hydrogen, C_{1-6} alkyl (e.g., methyl, ethyl, n-butyl, or t-butyl), aryl (e.g., phenyl), heteroaryl (e.g., pyridyl), aryl-C_{1-4} alkyl (e.g., benzyl), or heteroaryl-C_{1-4} alkyl (e.g., pyridylmethyl). In an embodiment, R^2 can be C_{1-4} alkyl, phenyl, pyridyl, imidazolyl, furanyl, thienyl, triazolyl, tetrazolyl, benzyl, phenylethyl, benzimidazolyl, benzothiazolyl, naphthylmethyl, naphthylethyl, or -C_{1-2} alkyl-pyridyl (i.e., pyridyl-C_{1-2} alkyl); each of the which can be independently optionally substituted with one or more substituents selected from the group consisting of fluoro, chloro, trifluoromethyl, methyl, ethyl, aminocarbonyl, alkylcarbonylamino, sulfamoyl, alkoxycarbonyl, and alkylcarbonyloxy.

In an embodiment, R^1 can be aryl or heteroaryl, e.g., wherein R^1 can be a substituted phenyl, an optionally substituted indanyl, or an optionally substituted heteroaryl selected from the group consisting of benzo[1,3]dioxolyl, benzo[*b*]thiophenyl, benzo-oxadiazolyl, benzothiadiazolyl, benzoimidazolyl, benzooxazolyl, benzothiazolyl, 2-oxo-benzooxazolyl, pyridyl, pyrimidinyl, 2,3-dihydro-benzo[1,4]dioxyl, 2,3-dihydro-benzofuryl, 2,3-dihydro-benzo[*b*]thiophenyl, 3,4-dihydro-benzo[1,4]oxazinyl, 3-oxo-benzo[1,4]oxazinyl, 1,1-dioxo-2,3-dihydro- benzo[*b*]thiophenyl, [1,2,4]triazolo[1,5-a]pyridyl, [1,2,4]triazolo[4,3-a]pyridyl, quinolinyl, quinoxalinyl, quinazolinyl, isoquinolinyl, and cinnolinyl.

In an embodiment, m can be 0-2.

In an embodiment, R^a can be C_{1-4} alkyl, C_{1-4} alkoxy, C_{1-4} alkylthio, halo, amino, oxo, aminocarbonyl, or alkoxycarbonyl. In one embodiment, R^a can be substituted at the 6-position.

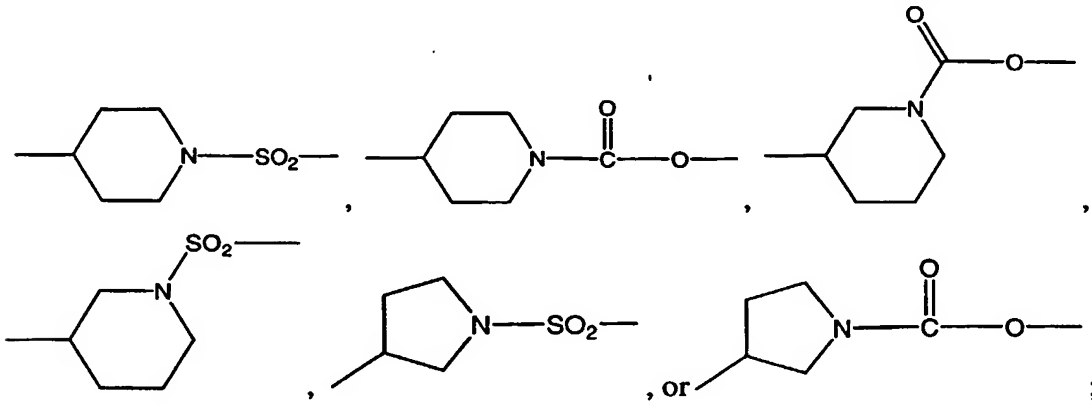
In an embodiment, A^1 can be N and A^2 can be NR^b, or A^1 can be NR^b and A^2 can be N; wherein R^b can be hydrogen or C_{1-4} alkyl.

In an embodiment, m can be 0-2; R^1 can be aryl or heteroaryl; R^2 can be hydrogen, C_{1-6} alkyl, aryl, heteroaryl, -C_{1-4} alkyl-aryl, or -C_{1-4} alkyl-heteroaryl; X can be a 4- to 8-membered monocyclic or bicyclic cycloalkyl or heterocycloalkyl (e.g., piperidinyl, piperazinyl, pyrrolidinyl, tetrahydrofuran, cyclohexyl, cyclopentyl, bicyclo[2.2.1]heptane, bicyclo[2.2.2]octane, bicyclo[3.2.1]octane, 2-oxa-bicyclo[2.2.2]octane, 2-aza-bicyclo[2.2.2]octane, 3-aza-bicyclo[3.2.1]octane, or 1-aza-bicyclo[2.2.2]octane); and Y can be -$N(R^b)$-C(O)-, -$N(R^b)$-$S(O)_2$-, -C(O)-, -C(O)-O-, -O-C(O)-, -C(O)-$N(R^b)$-, -$S(O)_p$-, -

O-, $-S(O)_2-N(R^b)-$, $-N(R^b)-$, $-N(R^b)-C(O)-O-$, $-N(R^b)-C(O)-N(R^c)-$, $-C(O)-N(R^b)-S(O)_p-N(R^c)-$, or $-C(O)-O-S(O)_p-N(R^b)-$.

In an embodiment, m can be 0-2; R^1 can be aryl (e.g., substituted phenyl) or heteroaryl; R^2 can be hydrogen, C_{1-6} alkyl (e.g., C_{1-4} alkyl), aryl, heteroaryl, $-C_{1-4}$ alkyl-aryl (e.g., benzyl), or $-C_{1-4}$ alkyl-heteroaryl (e.g., pyridylmethyl); X can be cyclohexyl, cyclopentyl, or bicyclo[2.2.2]octane; and Y can be $-N(R^b)-C(O)-$, $-N(R^b)-S(O)_2-$, $-C(O)-$, $-C(O)-O-$, $-O-C(O)-$, $-C(O)-N(R^b)-$, $-S(O)_p-$, $-O-$, $-S(O)_2-N(R^b)-$, $-N(R^b)-$, $-N(R^b)-C(O)-O-$, or $-N(R^b)-C(O)-N(R^c)-$, $-C(O)-N(R^b)-S(O)_p-N(R^c)-$, or $-C(O)-O-S(O)_p-N(R^b)-$, wherein each of R^b and R^c can independently be hydrogen or C_{1-4} alkyl; A^1 can be N and A^2 can be NH, or A^1 can be NH and A^2 can be N; m can be 1; and R^a can be substituted at the 6-position. For compounds of formula (I) wherein m is 1, R^a can be generally substituted at the 6-position.

In an embodiment, m can be 0-2; R^1 can be aryl (e.g., substituted phenyl) or heteroaryl; R^2 can be hydrogen, C_{1-6} alkyl (e.g., C_{1-4} alkyl), aryl, heteroaryl, $-C_{1-4}$ alkyl-aryl (e.g., benzyl), or $-C_{1-4}$ alkyl-heteroaryl (e.g., pyridylmethyl); -X-Y- can be



; A^1 can be N and A^2 can be NH, or A^1 can be NH and A^2 can be N; m can be 1; and R^a can be substituted at the 6-position.

Some examples of a compound of formula (I) are shown in Examples 5-215 below.

An *N*-oxide derivative or a pharmaceutically acceptable salt of each of the compounds of formula (I) is also within the scope of this invention. For example, a nitrogen ring atom of the imidazole core ring or a nitrogen-containing heterocyclyl substituent can form an oxide in the presence of a suitable oxidizing agent such as *m*-chloroperbenzoic acid or H_2O_2.

A compound of formula (I) that is acidic in nature (e.g., having a carboxyl or phenolic hydroxyl group) can form a pharmaceutically acceptable salt such as a sodium, potassium, calcium, or gold salt. Also within the scope of the invention are salts formed with pharmaceutically acceptable amines such as ammonia, alkyl amines, hydroxyalkylamines, and N-methylglycamine. A compound of formula (I) can be treated with an acid to form acid addition salts. Examples of such acids include hydrochloric acid, hydrobromic acid, hydroiodic acid, sulfuric acid, methanesulfonic acid, phosphoric acid, *p*-bromophenyl-sulfonic acid, carbonic acid, succinic acid, citric acid, benzoic acid, oxalic acid, malonic acid, salicylic acid, malic acid, fumaric acid, ascorbic acid, maleic acid, acetic acid, and other mineral and organic acids well known to those skilled in the art. The acid addition salts can be prepared by treating a compound of formula (I) in its free base form with a sufficient amount of an acid (e.g., hydrochloric acid) to produce an acid addition salt (e.g., a hydrochloride salt). The acid addition salt can be converted back to its free base form by treating the salt with a suitable dilute aqueous basic solution (e.g., sodium hydroxide, sodium bicarbonate, potassium carbonate, or ammonia). Compounds of formula (I) can also be, e.g., in a form of achiral compounds, racemic mixtures, optically active compounds, pure diastereomers, or a mixture of diastereomers.

Compounds of formula (I) exhibit surprisingly high affinity to the TGFβ family type I receptors, Alk 5 and/or Alk 4, e.g., with IC_{50} and K_i values of less than 10 μM under conditions as described below in Examples 215 and 217, respectively. Some compounds of formula (I) exhibit IC_{50} and K_i values of less than 1 μM (such as below 50 nM).

Compounds of formula (I) can also be modified by appending appropriate functionalities to enhance selective biological properties. Such modifications are known in the art and include those that increase biological penetration into a given biological system (e.g., blood, lymphatic system, central nervous system), increase oral availability, increase solubility to allow administration by injection, alter metabolism, and/or alter rate of excretion. Examples of these modifications include, but are not limited to, esterification with polyethylene glycols, derivatization with pivolates or fatty acid substituents, conversion to carbamates, hydroxylation of aromatic rings, and heteroatom-substitution in aromatic rings.

The present invention also features a pharmaceutical composition comprising a compound of formula (I) (or a combination of two or more compounds of formula (I)) and at least one pharmaceutically acceptable carrier. Also included in the present invention is a medicament composition including any of the compounds of formula (I), alone or in a combination, together with a suitable excipient.

The invention also features a method of inhibiting the TGFβ family type I receptors, Alk 5 and/or Alk 4 (e.g., with an IC_{50} value of less than 10 μM; such as, less than 1 μM; and for example, less than 5 nM) in a cell, including the step of contacting the cell with an effective amount of one or more compounds of formula (I). Also within the scope of the invention is a method of inihibiting the TGFβ and/or activin signaling pathway in a cell or in a subject (e.g., a mammal such as a human), including the step of contacting the cell with or administering to the subject an effective amount of one or more of the compounds of formula (I).

Also within the scope of the present invention is a method of treating a subject or preventing a subject from suffering a condition characterized by or resulting from an elevated level of TGFβ and/or activin activity. The method includes the step of administering to the subject an effective amount of one or more of the compounds of formula (I). The conditions include, for example, an accumulation of excess extracellular matrix; a fibrotic condition (e.g., glomerulonephritis, diabetic nephropathy, hypertensive nephropathy, lupus nephropathy or nephritis, hepatitis-induced cirrhosis, biliary fibrosis, scleroderma, pulmonary fibrosis, post-infarction cardiac fibrosis, fibrosclerosis, fibrotic cancers, fibroids, fibroma, fibroadenomas, or fibrosarcomas); TGFβ-induced metastasis of tumor cells; and carcinomas (e.g, carcinomas of the lung, breast, liver, biliary tract, gastrointestinal tract, head and neck, pancreas, prostate, cervix as well as multiple myeloma, melanoma, glioma, or glioblastomas).

As used herein, an "alkyl" group refers to a saturated aliphatic hydrocarbon group containing 1-8 (e.g., 1-6 or 1-4) carbon atoms. An alkyl group can be straight or branched. Examples of an alkyl group include, but are not limited to, methyl, ethyl, propyl, isopropyl, butyl, isobutyl, sec-butyl, tert-butyl, n-pentyl, n-heptyl, and 2-ethylhexyl. An alkyl group can be optionally substituted with one or more substituents such as alkoxy, cycloalkyloxy, heterocycloalkyloxy, aryloxy, heteroaryloxy, aralkyloxy, heteroarylalkoxy, amino, nitro,

carboxy, cyano, halo, hydroxy, sulfo, mercapto, alkylsulfanyl, alkylsulfinyl, alkylsulfonyl, aminocarbonyl, alkylcarbonylamino, cycloalkylcarbonylamino, cycloalkyl-alkylcarbonylamino, arylcarbonylamino, aralkylcarbonylamino, heterocycloalkyl-carbonylamino, heterocycloalkyl-alkylcarbonylamino, heteroarylcarbonylamino, heteroaralkylcarbonylamino, urea, thiourea, sulfamoyl, sulfamide, alkoxycarbonyl, or alkylcarbonyloxy.

As used herein, an "alkenyl" group refers to an aliphatic carbon group that contains 2-8 (e.g., 2-6 or 2-4) carbon atoms and at least one double bond. Like an alkyl group, an alkenyl group can be straight or branched. Examples of an alkenyl group include, but are not limited to, allyl, isoprenyl, 2-butenyl, and 2-hexenyl. An alkenyl group can be optionally substituted with one or more substituents such as alkoxy, cycloalkyloxy, heterocycloalkyloxy, aryloxy, heteroaryloxy, aralkyloxy, heteroarylalkoxy, amino, nitro, carboxy, cyano, halo, hydroxy, sulfo, mercapto, alkylsulfanyl, alkylsulfinyl, alkylsulfonyl, aminocarbonyl, alkylcarbonylamino, cycloalkylcarbonylamino, cycloalkyl-alkylcarbonylamino, arylcarbonylamino, aralkylcarbonylamino, heterocycloalkyl-carbonylamino, heterocycloalkyl-alkylcarbonylamino, heteroarylcarbonylamino, heteroaralkylcarbonylamino, urea, thiourea, sulfamoyl, sulfamide, alkoxycarbonyl, or alkylcarbonyloxy.

As used herein, an "alkynyl" group refers to an aliphatic carbon group that contains 2-8 (e.g., 2-6 or 2-4) carbon atoms and has at least one triple bond. An alkynyl group can be straight or branched. Examples of an alkynyl group include, but are not limited to, propargyl and butynyl. An alkynyl group can be optionally substituted with one or more substituents such as alkoxy, cycloalkyloxy, heterocycloalkyloxy, aryloxy, heteroaryloxy, aralkyloxy, heteroarylalkoxy, amino, nitro, carboxy, cyano, halo, hydroxy, sulfo, mercapto, alkylsulfanyl, alkylsulfinyl, alkylsulfonyl, aminocarbonyl, alkylcarbonylamino, cycloalkylcarbonylamino, cycloalkyl-alkylcarbonylamino, arylcarbonylamino, aralkylcarbonylamino, heterocycloalkyl-carbonylamino, heterocycloalkyl-alkylcarbonylamino, heteroarylcarbonylamino, heteroaralkylcarbonylamino, urea, thiourea, sulfamoyl, sulfamide, alkoxycarbonyl, or alkylcarbonyloxy.

As used herein, an "amino" group refers to $-NR^XR^Y$ wherein each of R^X and R^Y is independently hydrogen, alkyl, cycloalkyl, (cycloalkyl)alkyl, aryl, aralkyl,

heterocycloalkyl, (heterocycloalkyl)alkyl, heteroaryl, or heteroaralkyl. When the term "amino" is not the terminal group (e.g., alkylcarbonylamino), it is represented by $-NR^X-$. R^X has the same meaning as defined above.

As used herein, an "aryl" group refers to phenyl, naphthyl, or a benzofused group having 2 to 3 rings. For example, a benzofused group includes phenyl fused with one or two C_{4-8} carbocyclic moieties, e.g., 1, 2, 3, 4-tetrahydronaphthyl, indanyl, or fluorenyl. An aryl is optionally substituted with one or more substituents such as alkyl (including carboxyalkyl, hydroxyalkyl, and haloalkyl such as trifluoromethyl), alkenyl, alkynyl, cycloalkyl, (cycloalkyl)alkyl, heterocycloalkyl, (heterocycloalkyl)alkyl, aryl, heteroaryl, alkoxy, cycloalkyloxy, heterocycloalkyloxy, aryloxy, heteroaryloxy, aralkyloxy, heteroaralkyloxy, aroyl, heteroaroyl, amino, nitro, carboxy, alkoxycarbonyl, alkylcarbonyloxy, aminocarbonyl, alkylcarbonylamino, cycloalkylcarbonylamino, (cycloalkyl)alkylcarbonylamino, arylcarbonylamino, aralkylcarbonylamino, (heterocycloalkyl)carbonylamino, (heterocycloalkyl)alkylcarbonylamino, heteroarylcarbonylamino, heteroaralkylcarbonylamino, cyano, halo, hydroxy, acyl, mercapto, alkylsulfanyl, sulfoxy, urea, thiourea, sulfamoyl, sulfamide, oxo, or carbamoyl.

As used herein, an "aralkyl" group refers to an alkyl group (e.g., a C_{1-4} alkyl group) that is substituted with an aryl group. Both "alkyl" and "aryl" have been defined above. An example of an aralkyl group is benzyl.

As used herein, a "cycloalkyl" group refers to an aliphatic carbocyclic ring of 3-10 (e.g., 4-8) carbon atoms. Examples of cycloalkyl groups include cyclopropyl, cyclopentyl, cyclohexyl, cycloheptyl, adamantyl, norbornyl, cubyl, octahydro-indenyl, decahydro-naphthyl, bicyclo[3.2.1]octyl, bicyclo[2.2.2]octyl, bicyclo[3.3.1]nonyl, and bicyclo[3.2.3]nonyl,. A "cycloalkenyl" group, as used herein, refers to a non-aromatic carbocyclic ring of 3-10 (e.g., 4-8) carbon atoms having one or more double bond. Examples of cycloalkenyl groups include cyclopentenyl, 1,4-cyclohexa-di-enyl, cycloheptenyl, cyclooctenyl, hexahydro-indenyl, octahydro-naphthyl, bicyclo[2.2.2]octenyl, and bicyclo[3.3.1]nonenyl,. A cycloalkyl or cycloalkenyl group can be optionally substituted with one or more substituents such as alkyl (including carboxyalkyl, hydroxyalkyl, and haloalkyl such as trifluoromethyl), alkenyl, alkynyl, cycloalkyl, (cycloalkyl)alkyl, heterocycloalkyl, (heterocycloalkyl)alkyl, aryl, heteroaryl,

alkoxy, cycloalkyloxy, heterocycloalkyloxy, aryloxy, heteroaryloxy, aralkyloxy, heteroaralkyloxy, aroyl, heteroaroyl, amino, nitro, carboxy, alkoxycarbonyl, alkylcarbonyloxy, aminocarbonyl, alkylcarbonylamino, cycloalkylcarbonylamino, (cycloalkyl)alkylcarbonylamino, arylcarbonylamino, aralkylcarbonylamino, (heterocycloalkyl)carbonylamino, (heterocycloalkyl)alkylcarbonylamino, heteroarylcarbonylamino, heteroaralkylcarbonylamino, cyano, halo, hydroxy, acyl, mercapto, alkylsulfanyl, sulfoxy, urea, thiourea, sulfamoyl, sulfamide, oxo, or carbamoyl.

As used herein, a "heterocycloalkyl" group refers to a 3- to 10-membered (e.g., 4- to 8-membered) saturated ring structure, in which one or more of the ring atoms is a heteroatom, e.g., N, O, or S. Examples of a heterocycloalkyl group include piperidinyl, piperazinyl, tetrahydropyranyl, tetrahydrofuryl, dioxolanyl, oxazolidinyl, isooxazolidinyl, morpholinyl, octahydro-benzofuryl, octahydro-chromenyl, octahydro-thiochromenyl, octahydro-indolyl, octahydro-pyrindinyl, decahydro-quinolinyl, octahydro-benzo[*b*]thiophenyl, 2-oxa-bicyclo[2.2.2]octyl, 1-aza-bicyclo[2.2.2]octyl, 3-aza-bicyclo[3.2.1]octyl, anad 2,6-dioxa-tricyclo[3.3.1.$0^{3,7}$]nonyl. A "heterocycloalkenyl" group, as used herein, refers to a 3- to 10-membered (e.g., 4- to 8-membered) non-aromatic ring structure having one or more double bonds, and wherein one or more of the ring atoms is a heteroatom, e.g., N, O, or S. A heterocycloalkyl or heterocycloalkenyl group can be optionally substituted with one or more substituents such as alkyl (including carboxyalkyl, hydroxyalkyl, and haloalkyl such as trifluoromethyl), alkenyl, alkynyl, cycloalkyl, (cycloalkyl)alkyl, heterocycloalkyl, (heterocycloalkyl)alkyl, aryl, heteroaryl, alkoxy, cycloalkyloxy, heterocycloalkyloxy, aryloxy, heteroaryloxy, aralkyloxy, heteroaralkyloxy, aroyl, heteroaroyl, amino, nitro, carboxy, alkoxycarbonyl, alkylcarbonyloxy, aminocarbonyl, alkylcarbonylamino, cycloalkylcarbonylamino, (cycloalkyl)alkylcarbonylamino, arylcarbonylamino, aralkylcarbonylamino, (heterocycloalkyl)carbonylamino, (heterocycloalkyl)alkylcarbonylamino, heteroarylcarbonylamino, heteroaralkylcarbonylamino, cyano, halo, hydroxy, acyl, mercapto, alkylsulfanyl, sulfoxy, urea, thiourea, sulfamoyl, sulfamide, oxo, or carbamoyl.

A "heteroaryl" group, as used herein, refers to a monocyclic, bicyclic, or tricyclic ring structure having 5 to 15 ring atoms wherein one or more of the ring atoms is a heteroatom, e.g., N, O, or S and wherein one ore more rings of the bicyclic or tricyclic ring

structure is aromatic. Some examples of heteroaryl are pyridyl, furyl, pyrrolyl, thienyl, thiazolyl, oxazolyl, imidazolyl, indolyl, tetrazolyl, benzofuryl, benzthiazolyl, xanthene, thioxanthene, phenothiazine, dihydroindole, and benzo[1,3]dioxole. A heteroaryl is optionally substituted with one or more substituents such as alkyl (including carboxyalkyl, hydroxyalkyl, and haloalkyl such as trifluoromethyl), alkenyl, alkynyl, cycloalkyl, (cycloalkyl)alkyl, heterocycloalkyl, (heterocycloalkyl)alkyl, aryl, heteroaryl, alkoxy, cycloalkyloxy, heterocycloalkyloxy, aryloxy, heteroaryloxy, aralkyloxy, heteroaralkyloxy, aroyl, heteroaroyl, amino, nitro, carboxy, alkoxycarbonyl, alkylcarbonyloxy, aminocarbonyl, alkylcarbonylamino, cycloalkylcarbonylamino, (cycloalkyl)alkylcarbonylamino, arylcarbonylamino, aralkylcarbonylamino, (heterocycloalkyl)carbonylamino, (heterocycloalkyl)alkylcarbonylamino, heteroarylcarbonylamino, heteroaralkylcarbonylamino, cyano, halo, hydroxy, acyl, mercapto, alkylsulfanyl, sulfoxy, urea, thiourea, sulfamoyl, sulfamide, oxo, or carbamoyl. A "heteroaralkyl" group, as used herein, refers to an alkyl group (e.g., a C_{1-4} alkyl group) that is substituted with a heteroaryl group. Both "alkyl" and "heteroaryl" have been defined above.

As used herein, "cyclic moiety" includes cycloalkyl, heterocycloalkyl, cycloalkenyl, heterocycloalkenyl, aryl, or heteroaryl, each of which has been defined previously.

As used herein, an "acyl" group refers to a formyl group or alkyl-C(=O)- where "alkyl" has been defined previously. Acetyl and pivaloyl are examples of acyl groups.

As used herein, a "carbamoyl" group refers to a group having the structure -O-CO-NR^xR^y or -NR^x-CO-O-R^z wherein R^x and R^y have been defined above and R^z can be alkyl, aryl, aralkyl, heterocycloalkyl, heteroaryl, or heteroaralkyl.

As used herein, a "carboxy" and a "sulfo" group refer to -COOH and -SO_3H, respectively.

As used herein, an "alkoxy" group refers to an alkyl-O- group where "alkyl" has been defined previously.

As used herein, a "sulfoxy" group refers to -O-SO-R^X or –SO-O-R^X, where R^X has been defined above.

As used herein, a "halogen" or "halo" group refers to fluorine, chlorine, bromine or iodine.

As used herein, a "sulfamoyl" group refers to the structure $-S(O)_2-NR^xR^y$ or $-NR^x-S(O)_2-R^z$ wherein R^x, R^y, and R^z have been defined above.

As used herein, a "sulfamide" group refers to the structure $-NR^X-S(O)_2-NR^YR^Z$ wherein R^X, R^Y, and R^Z have been defined above.

As used herein, a "urea" group refers to the structure $-NR^X-CO-NR^YR^Z$ and a "thiourea" group refers to the structure $-NR^X-CS-NR^YR^Z$. R^X, R^Y, and R^Z have been defined above.

As used herein, an effective amount is defined as the amount required to confer a therapeutic effect on the treated patient, and is typically determined based on age, surface area, weight, and condition of the patient. The interrelationship of dosages for animals and humans (based on milligrams per meter squared of body surface) is described by Freireich et al., *Cancer Chemother. Rep.*, 50: 219 (1966). Body surface area may be approximately determined from height and weight of the patient. See, e.g., Scientific Tables, Geigy Pharmaceuticals, Ardsley, New York, 537 (1970). As used herein, "patient" refers to a mammal, including a human.

An antagonist, as used herein, is a molecule that binds to the receptor without activating the receptor. It competes with the endogenous ligand(s) or substrate(s) for binding site(s) on the receptor and, thus inhibits the ability of the receptor to transduce an intracellular signal in response to endogenous ligand binding.

As compounds of formula (I) are antagonists of TGFβ receptor type I (Alk5) and/or activin receptor type I (Alk4), these compounds are useful in inhibiting the consequences of TGFβ and/or activin signal transduction such as the production of extracellular matrix (e.g., collagen and fibronectin), the differentiation of stromal cells to myofibroblasts, and the stimulation of and migration of inflammatory cells. Thus, compounds of formula (I) inhibit pathological inflammatory and fibrotic responses and possess the therapeutic utility of treating and/or preventing disorders or diseases for which reduction of TGFβ and/or activin activity is desirable (e.g., various types of fibrosis or progressive cancers). In addition, the compounds of formula (I) are useful for studying and researching the role of TGFβ receptor type I (Alk5) and/or activin receptor type I (Alk4), such as their role in

cellular processes, for example, signal transduction, production of extracellular matrix, the differentiation of stromal cells to myofibroblasts, and the stimulation of and migration of inflammatory cells.

Unless otherwise defined, all technical and scientific terms used herein have the same meaning as commonly understood by one of ordinary skill in the art to which this invention belongs. All publications, patent applications, patents, and other references mentioned herein are incorporated by reference in their entirety. In addition, the materials, methods, and examples are illustrative only and not intended to be limiting.

Other features and advantages of the invention will be apparent from the following detailed description, and from the claims.

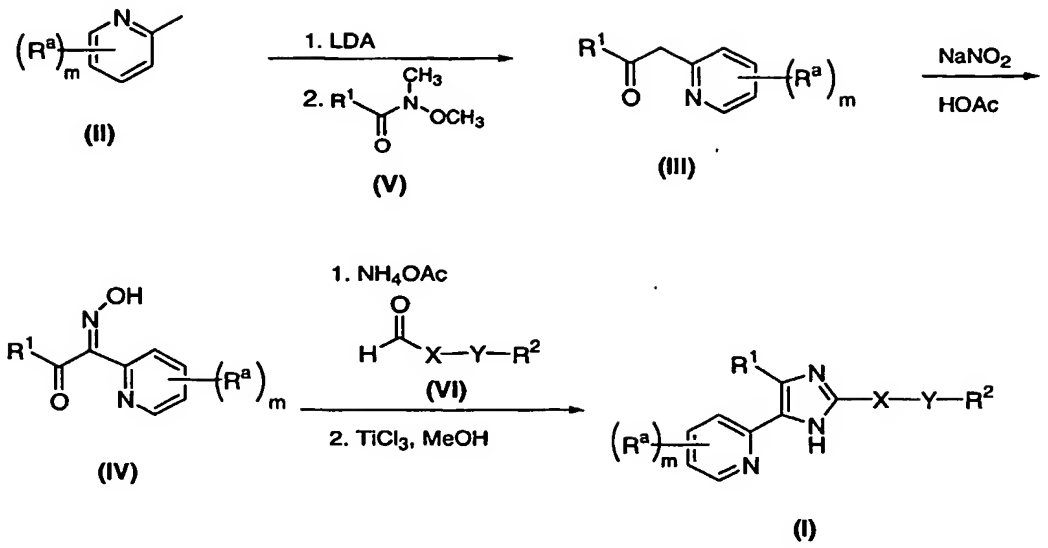
DETAILED DESCRIPTION OF THE INVENTION

In general, the invention features compounds of formula (I), which exhibit surprisingly high affinitiy for the TGFβ family type I receptors, Alk 5 and/or Alk 4.

Synthesis of the Compounds of formula (I)

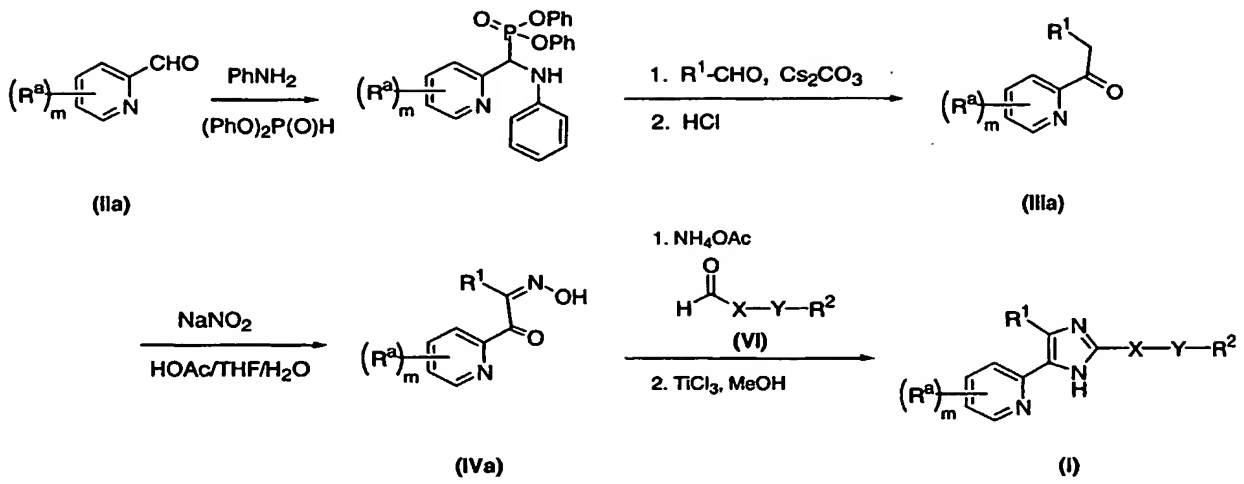
Compounds of formula (I) may be prepared by a number of known methods from commercially available or known starting materials. In one method, compounds of formula (I) wherein A^1 is N and A^2 is NH, or A^1 is NH and A^2 is N are prepared according to Scheme 1a or Scheme 1b below. Specifically, in Scheme 1a, optionally substituted 2-methylpyridine (II) is deprotonated by LDA before reacting with R^1-substituted carboxylic acid methoxy-methyl-amide (V) to form an R^1-(6-methylpyridyl)-ketone (III). R^1 has been defined above. See Example 3B below. The methoxy-methyl-amide can be prepared by reacting a corresponding acid chloride (i.e., R^1-CO-Cl) with *N,O*-dimethylhydroxylamine hydrochloride. See Example 2 below. The R^1-(6-methylpyridyl)-ketone (III) can then be treated with sodium nitrite in acetic acid to afford an α-keto-oxime (IV), which can undergo further reaction with an appropriate substituted (and optionally protected) aldehyde (VI) in the presence of ammonium acetate to yield a compound of formula (I).

Scheme 1a



In another method, the above-described compounds of formula (I) can be prepared according to Scheme 1b below. Specifically, R^1-substituted pyridine-2-carbaldehyde (IIa) is first reacted with aniline and diphenyl phosphite to form a resulting *N,P*-acetal, which can further couple with an R^1-substituted aldehyde to produced an (R^1-methyl)-pyridyl-ketone (IIIa). See, e.g., Journet et al., *Tetrahedron Lett.* 39:1717-1720 (1998) and Example 3C below. Treatment of the (R^1-methyl)-pyridyl-ketone (IIIa) with sodium nitrite in acetic acid produces an α-keto-oxime (IVa), which can undergo reaction with an appropriate substituted (and optionally protected) aldehyde (VI) to yield a compound of formula (I) as described in Scheme 1a above.

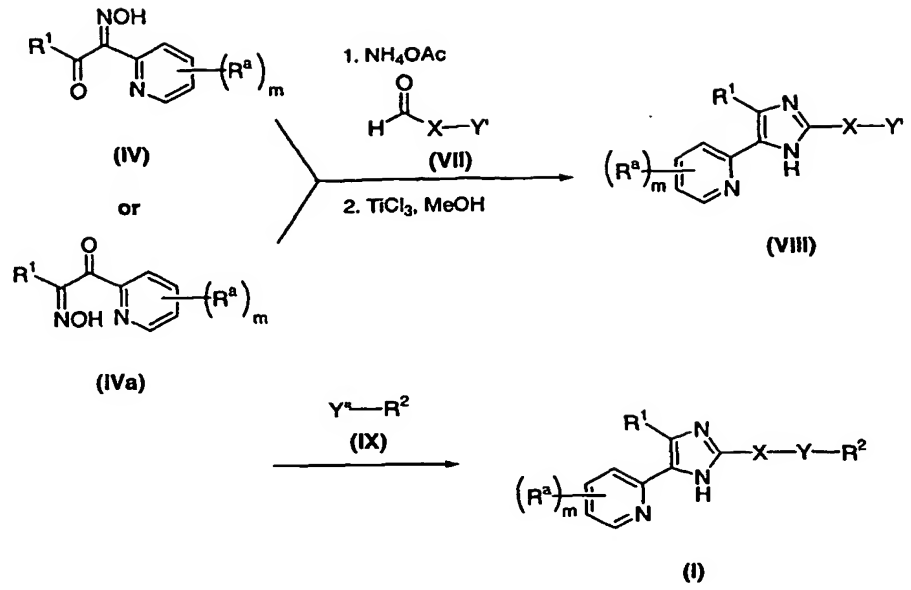
Scheme 1b



If compound (VI) is in its protected form, appropriate deprotecting agents can be applied to the resulting compound after the coupling reaction of compound (IV) or (IVa) and compound (VI) to yield a compound of formula (I). See, e.g., T. W. Greene, *Protective Groups in Organic Synthesis*, John Wiley & Sons, Inc., New York (1981), for suitable protecting groups.

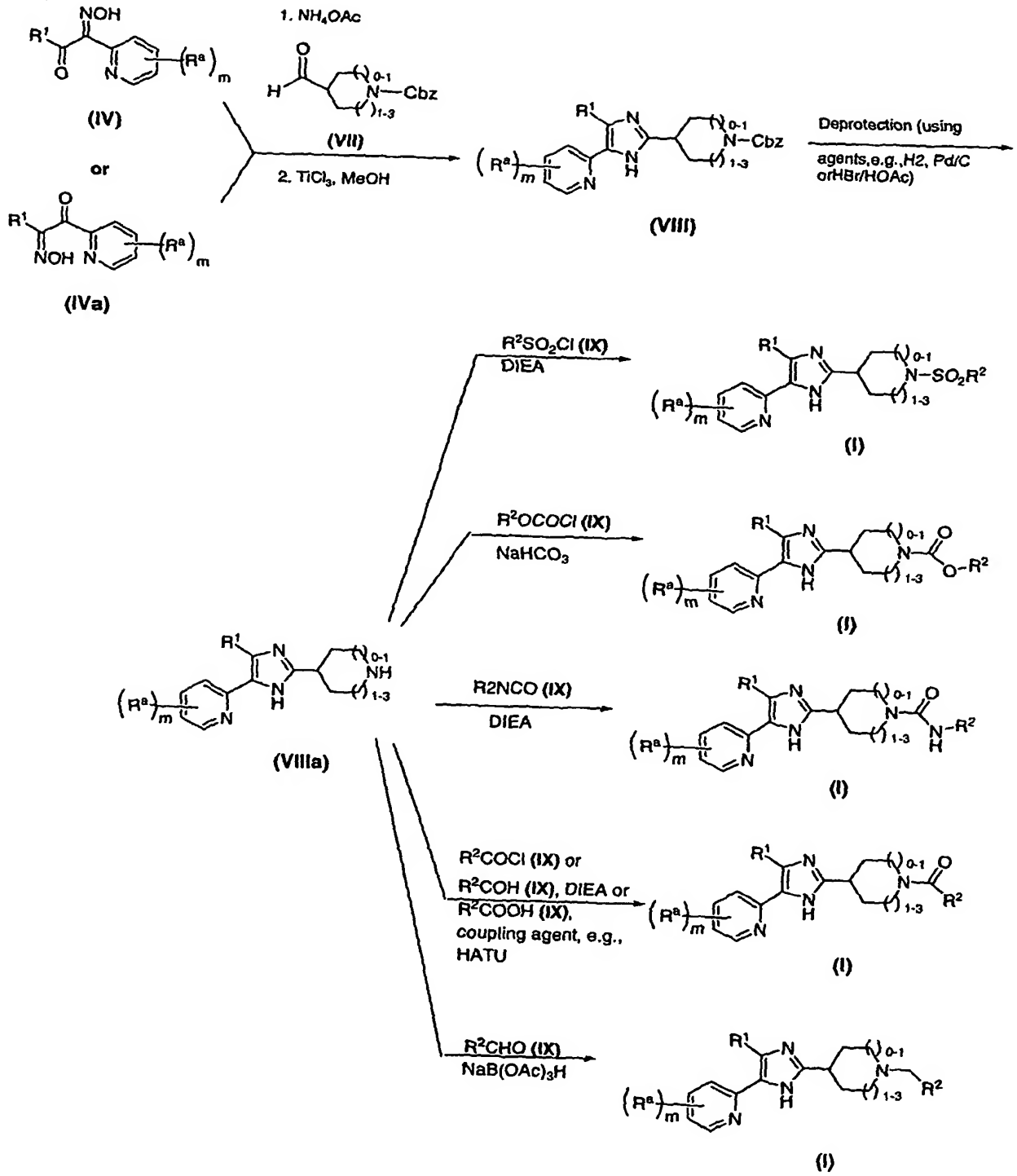
Alternatively, a compound of formula (I) can be prepared by reacting intermediate (IV) or (IVa) with an aldehyde (VII) to yield a further intermediate (VIII), which can then react with compound (IX) to yield a compound of formula (I). Note that moieties Y' and Y" are precursors of moiety Y. See Scheme 2 below. In addition, desired substitutions at R^a can be obtained by selecting, for example, the appropriate compound (IIa) intermediate. See, e.g., Example 3A below.

Scheme 2



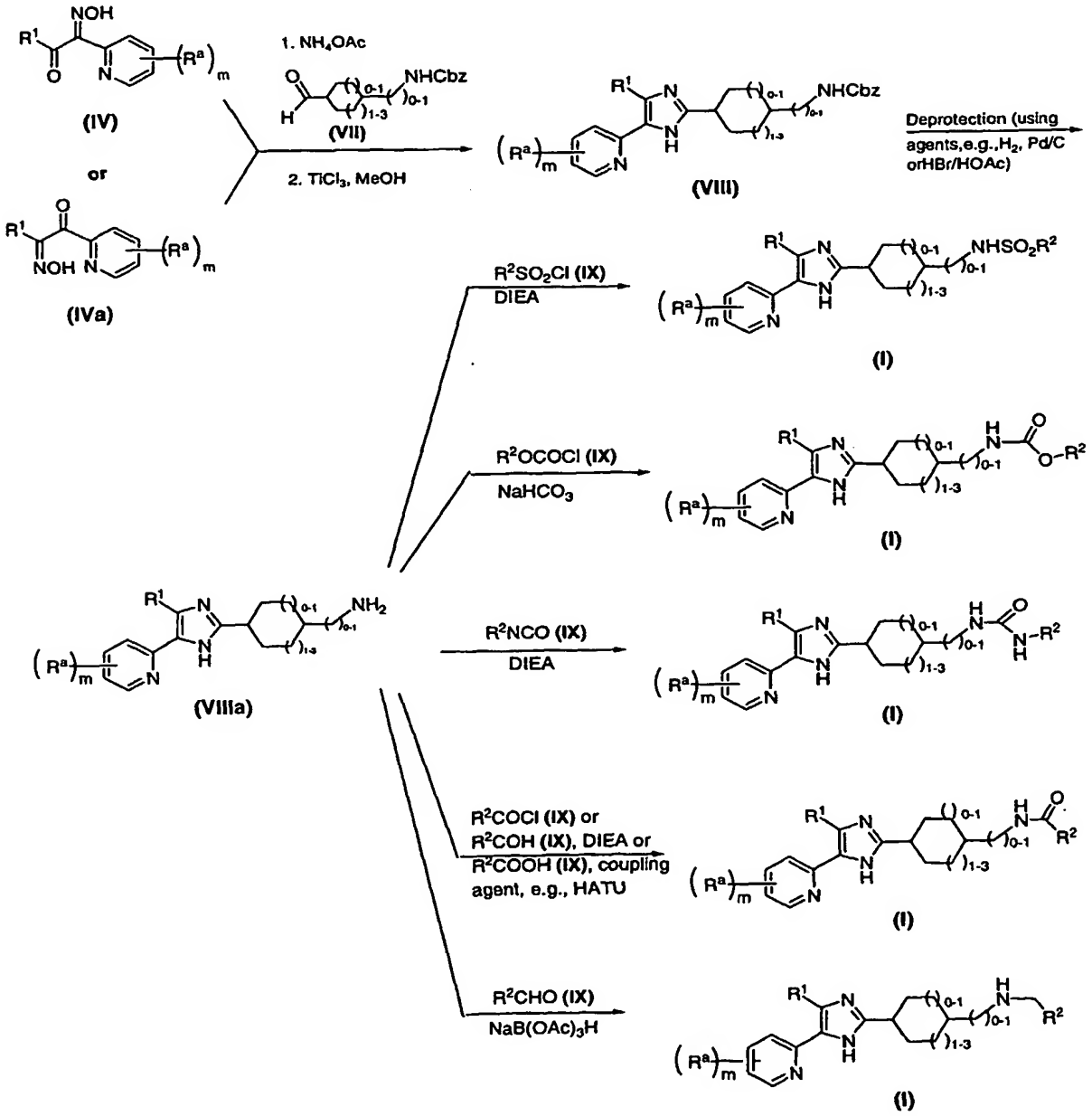
In some embodiments, moiety X in compound (VII) is a nitrogen-containing heterocycloalkyl (e.g., piperidine). The nitrogen ring atom can be protected by a nitrogen protecting group (e.g., Cbz, Boc, or FMOC) before coupling to compound (IV) or (IVa) and deprotected afterwards (see first step of Scheme 3) to yield compound (VIIIa). This compound can further react with various compounds (IX) to produce a compound of formula (I). See second steps of Scheme 3 below. It should be noted that compound (VIII) or compound (VIIIa) can be a compound of formula (I) as well.

Scheme 3

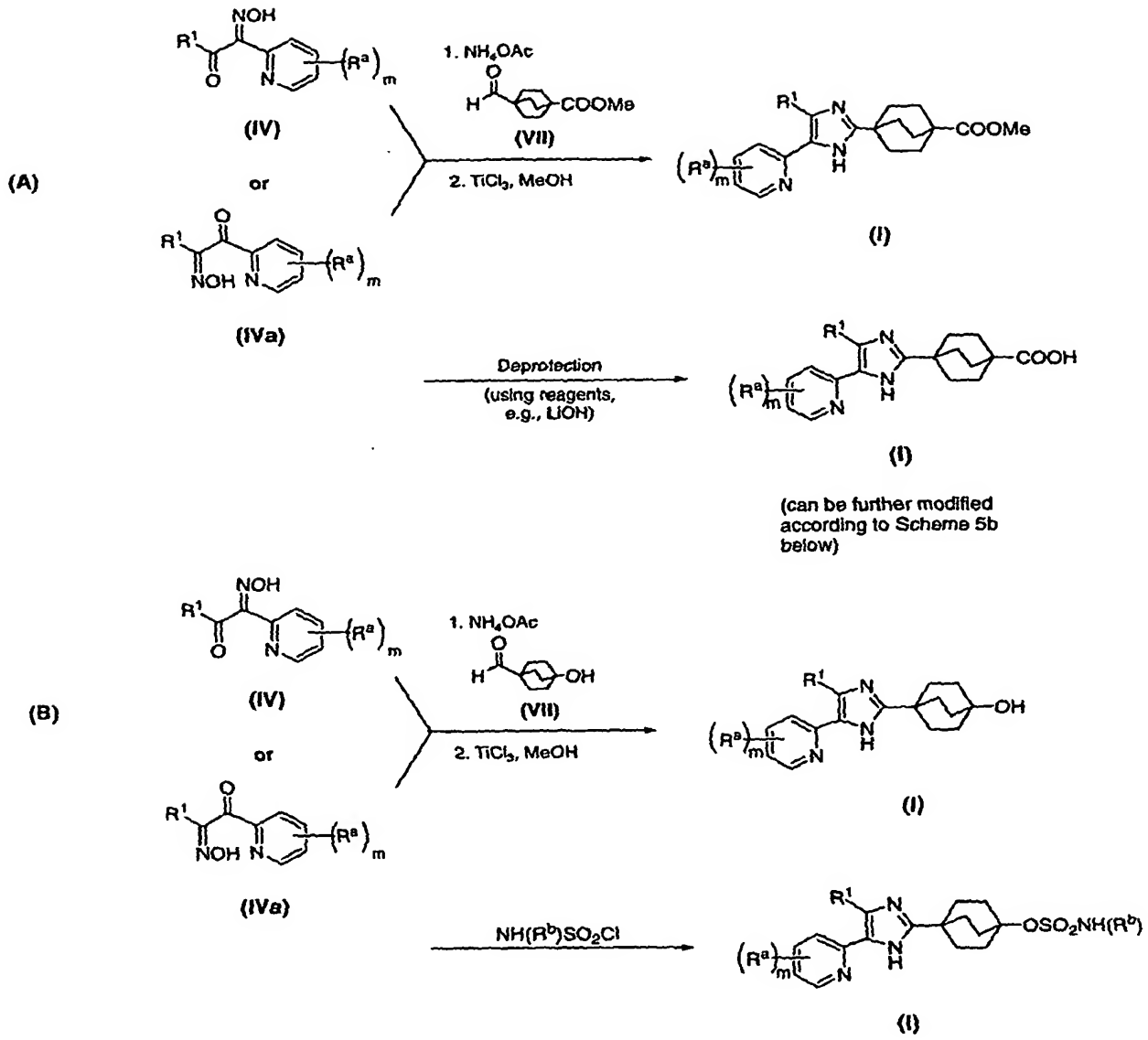

1. NH4OAc
(IV)
or
(IVa)
(VII)
2. TiCl3, MeOH
(VIII)
Deprotection (using agents,e.g.,H2, Pd/C orHBr/HOAc)
(VIIIa)
R2SO2Cl (IX) DIEA
R2OCOCl (IX) NaHCO3
R2NCO (IX) DIEA
R2COCl (IX) or R2COH (IX), DIEA or R2COOH (IX), coupling agent, e.g., HATU
R2CHO (IX) NaB(OAc)3H
(I)

Similarly, when moiety X in compound (VII) is a cycloalkyl (e.g., cyclopentyl, cyclohexyl, or bicyclo[2.2.2]octane), it can be further functionalized to form a compound of formula (I) as depicted in Schemes 4, 5a, 5b, and 5c below.

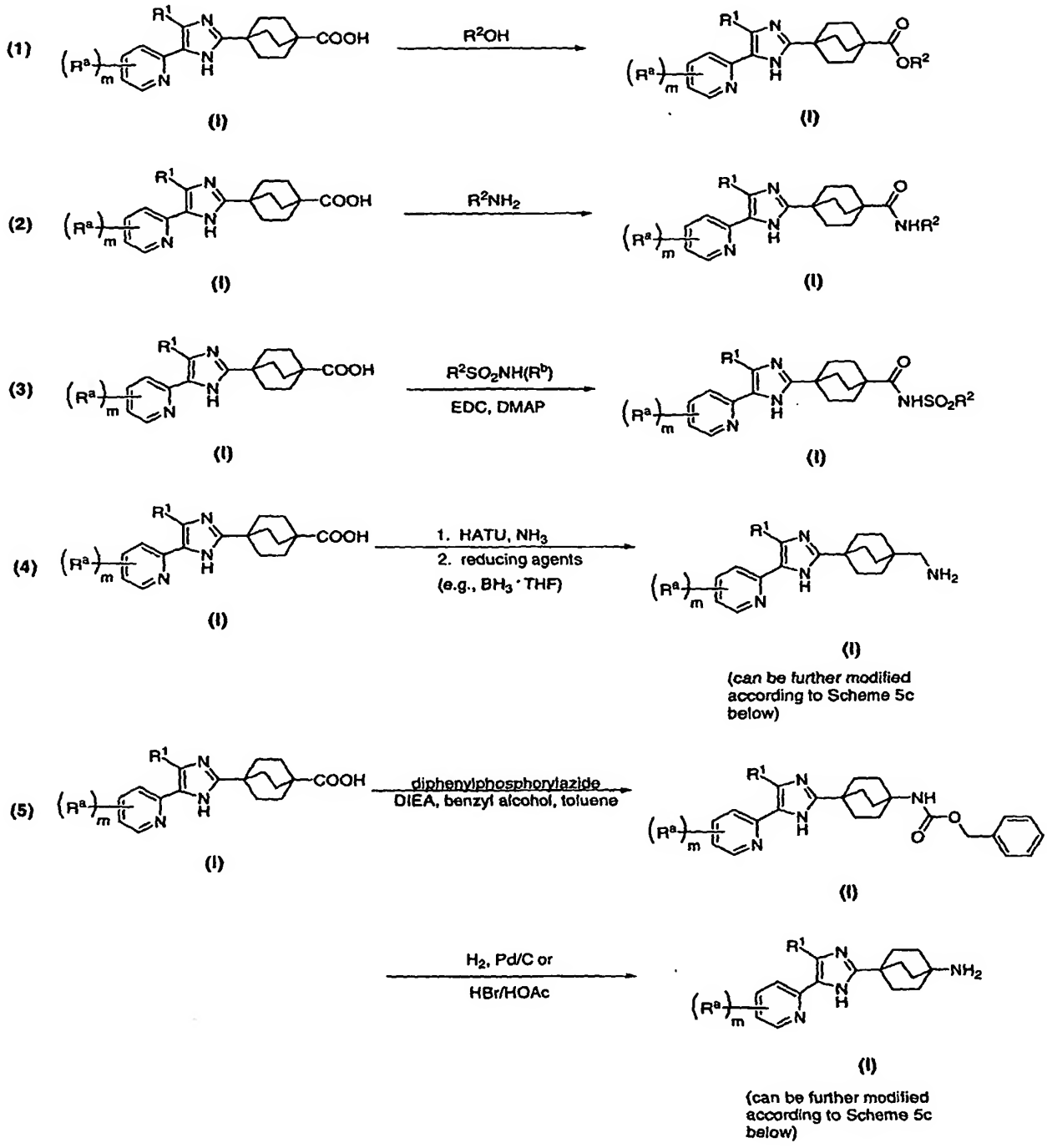
Scheme 4



Scheme 5a

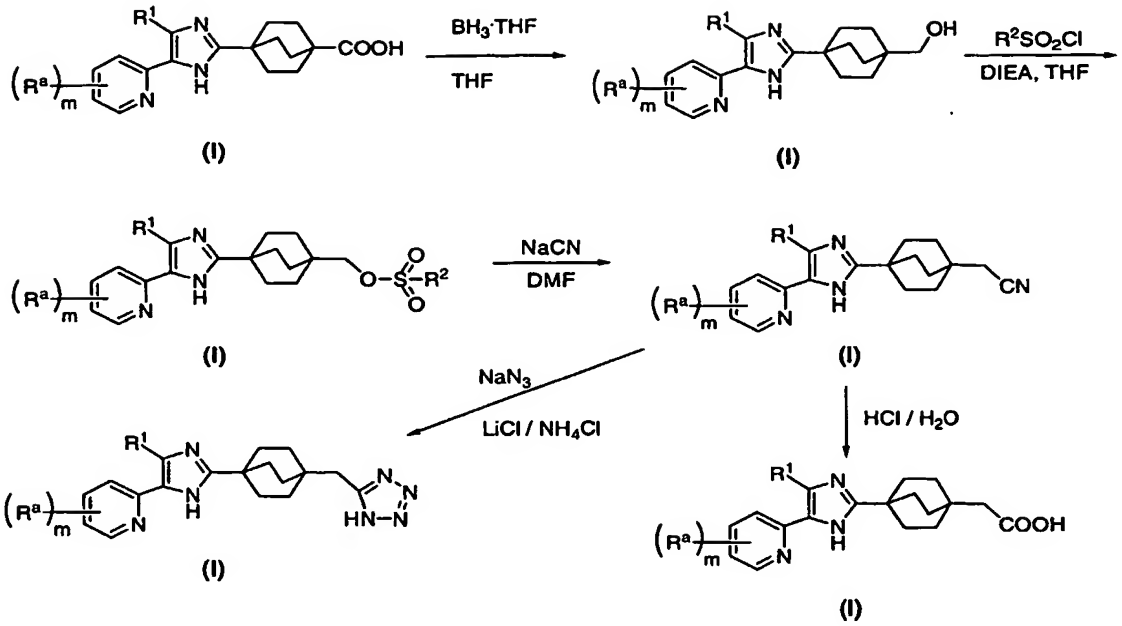

(A)
(IV)
or
(IVa)
1. NH4OAc
(VII)
2. TiCl3, MeOH
(I)
Deprotection
(using reagents, e.g., LiOH)
(I)
(can be further modified according to Scheme 5b below)
(B)
(IV)
or
(IVa)
1. NH4OAc
(VII)
2. TiCl3, MeOH
(I)
NH(Rb)SO2Cl
(I)

Scheme 5b

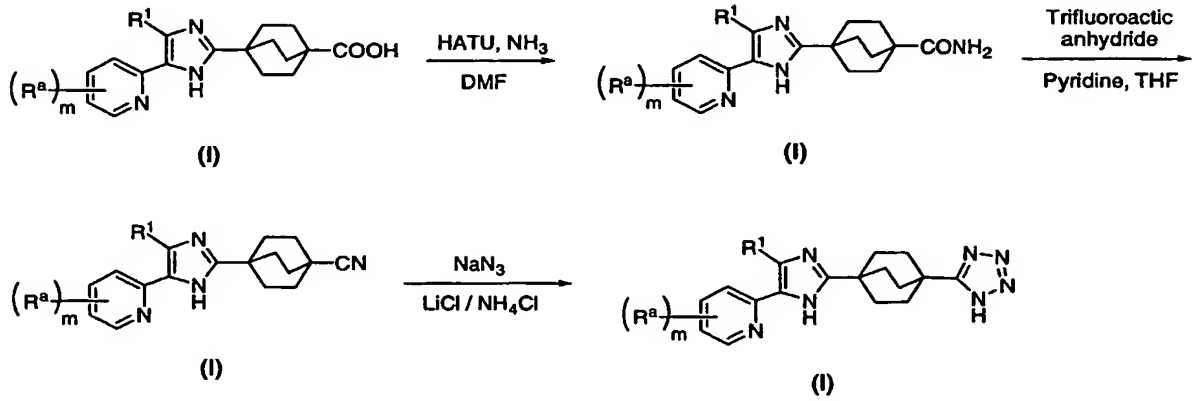

(1)
R²OH
(I)
(I)
(2)
R²NH₂
(I)
(I)
(3)
R²SO₂NH(Rᵇ)
EDC, DMAP
(I)
(I)
(4)
1. HATU, NH₃
2. reducing agents
(e.g., BH₃·THF)
(I)
(I)
(can be further modified according to Scheme 5c below)
(5)
diphenylphosphorylazide
DIEA, benzyl alcohol, toluene
(I)
(I)
H₂, Pd/C or
HBr/HOAc
(I)
(I)
(can be further modified according to Scheme 5c below)

5

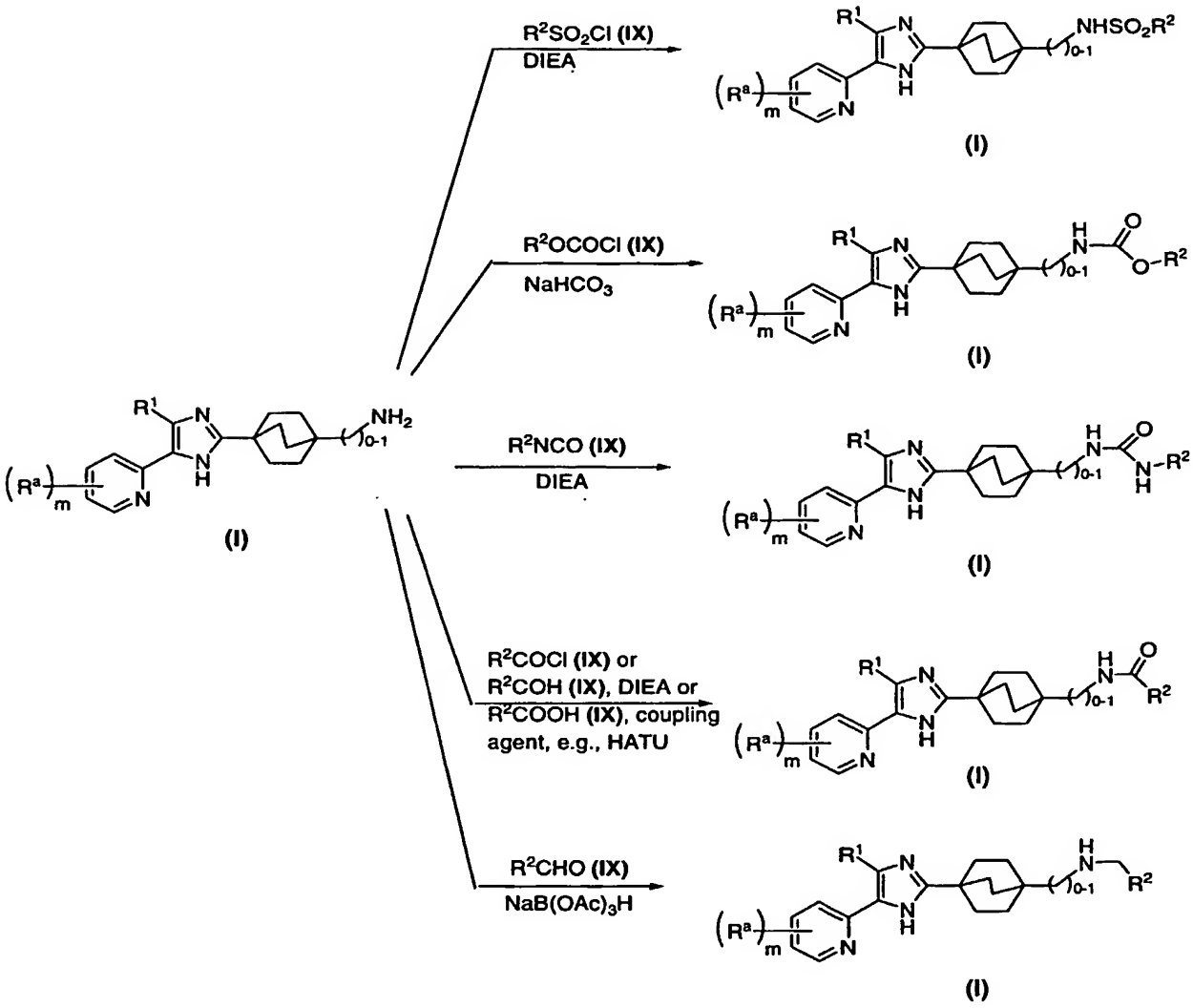
(6)


BH3·THF
THF
R2SO2Cl
DIEA, THF
NaCN
DMF
NaN3
LiCl / NH4Cl
HCl / H2O
(I)

(7)


HATU, NH3
DMF
Trifluoroactic anhydride
Pyridine, THF
NaN3
LiCl / NH4Cl
(I)

Scheme 5c

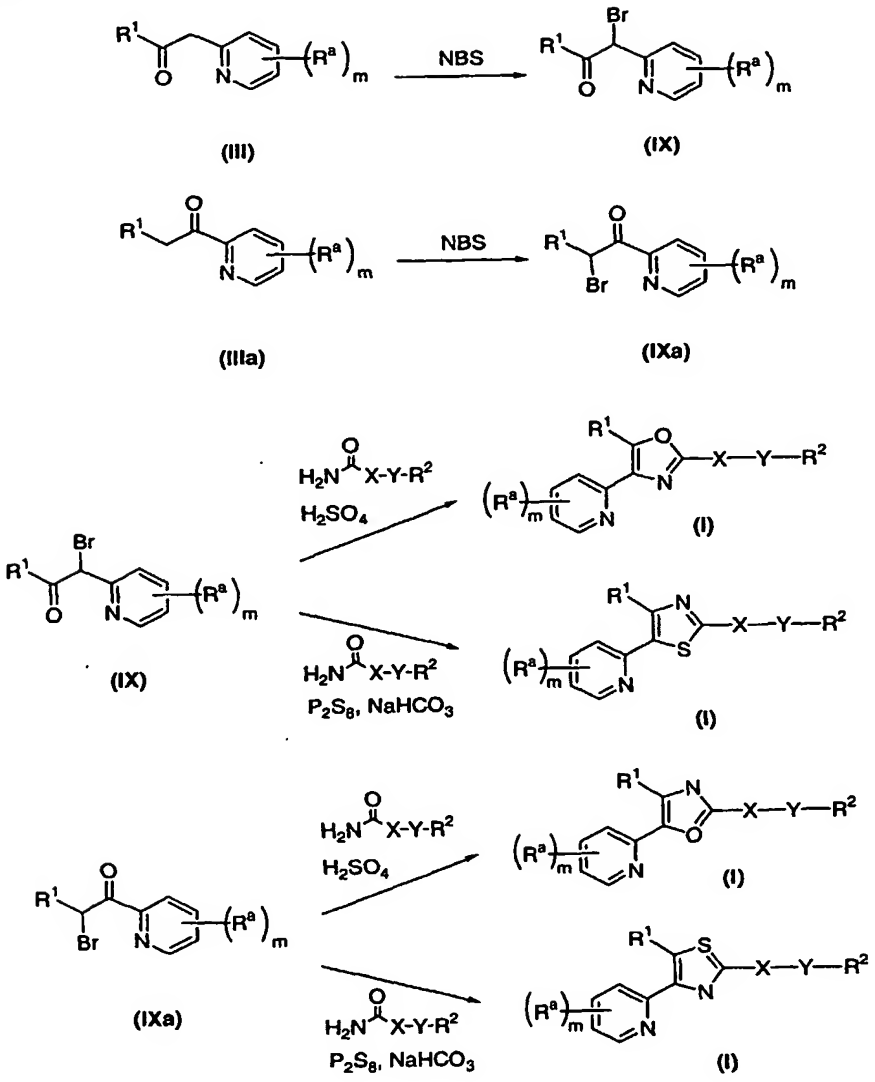


Compounds of formula (I) wherein A^1 is N and A^2 is NR^b (or A^1 is NR^b and A^2 is N) can be prepared by known methods. For example, compounds of formula (I) with an unsubstituted imidazolyl core ring can be treated with R^bI and $CsCO_3$ to produce a compound of formula (I) having a substituted imidazolyl core ring. See, e.g., Liverton, et al., *J. Med. Chem.*, 42: 2180-2190 (1999).

Compounds of formula (I) wherein A^1 is O and A^2 is NH (or A^1 is NH and A^2 is O) or wherein A^1 is S and A^2 is NH (or A^1 is NH and A^2 is S), can be prepared according to known methods. One of these methods employs the same intermediate (III) or (IIIa) as

described above. See, e.g., Revesz, et al., *Bioorg. & Med. Chem. Lett.* 10: 1261-1264 (2000) and Scheme 6 below.

Scheme 6



As is well known to a skilled person in chemistry, desired substitutions can be placed on the 2-pyridyl ring in the last step of the synthesis. See, e.g., Example 24 below.

Uses of Compounds of formula (I)

As discussed above, hyperactivity of the TGFβ family signaling pathways can result in excess deposition of extracellular matrix and increased inflammatory responses, which can then lead to fibrosis in tissues and organs (e.g., lung, kidney, and liver) and ultimately result in organ failure. See, e.g., Border, W.A. and Ruoslahti E. *J. Clin. Invest.* 90: 1-7 (1992) and Border, W.A. and Noble, N.A. *N. Engl. J. Med.* 331: 1286-1292 (1994). Studies have been shown that the expression of TGFβ and/or activin mRNA and the level of TGFβ and/or activin are increased in patients suffering from various fibrotic disorders, e.g., fibrotic kidney diseases, alcohol-induced and autoimmune hepatic fibrosis, myelofibrosis, bleomycin-induced pulmonary fibrosis, and idiopathic pulmonary fibrosis.

Compounds of formula (I), which are antagonists of the TGFβ family type I receptors Alk 5 and/or Alk 4, and inhibit TGFβ and/or activin signaling pathway, are therefore useful for treating and/or preventing fibrotic disorders or diseases mediated by an increased level of TGFβ and/or activin activity. As used herein, a compound inhibits the TGFβ family signaling pathway when it binds (e.g., with an IC_{50} value of less than 10 μM; such as, less than 1 μM; and for example, less than 5 nM) to a receptor of the pathway (e.g., Alk 5 and/or Alk 4), thereby competing with the endogenous ligand(s) or substrate(s) for binding site(s) on the receptor and reducing the ability of the receptor to transduce an intracellular signal in response to the endogenous ligand or substrate binding. The aforementioned disorders or diseases include any condition (a) marked by the presence of an abnormally high level of TGFβ and/or activin; and/or (b) an excess accumulation of extracellular matrix; and/or (c) an increased number and synthetic activity of myofibroblasts. These disorders or diseases include, but are not limited to, fibrotic conditions such as scleroderma, idiopathic pulmonary fibrosis, glomerulonephritis, diabetic nephropathy, lupus nephritis, hypertension-induced nephropathy, ocular or corneal scarring, hepatic or biliary fibrosis, acute lung injury, pulmonary fibrosis, post-infarction cardiac fibrosis, fibrosclerosis, fibrotic cancers, fibroids, fibroma, fibroadenomas, and fibrosarcomas. Other fibrotic conditions for which preventive treatment with compounds of formula (I) can have therapeutic utility include radiation therapy-induced fibrosis, chemotherapy-induced fibrosis, and surgically induced scarring including surgical adhesions, laminectomy, and coronary restenosis.

Increased TGFβ activity is also found to manifest in patients with progressive cancers. Studies have shown that in late stages of various cancers, both the tumor cells and the stromal cells within the tumors generally overexpress TGFβ. This leads to stimulation of angiogenesis and cell motility, suppression of the immune system, and increased interaction of tumor cells with the extracellular matrix. See, e.g., Hojo, M. et al., *Nature* 397: 530-534 (1999). As a result, the tumor cells become more invasive and metastasize to distant organs. See, e.g., Maehara, Y. et al., *J. Clin. Oncol.* 17: 607-614 (1999) and Picon, A. et al., *Cancer Epidemiol. Biomarkers Prev.* 7: 497-504 (1998). Thus, compounds of formula (I), which are antagonists of the TGFβ type I receptor and inhibit TGFβ signaling pathways, are also useful for treating and/or preventing various late stage cancers which overexpress TGFβ. Such late stage cancers include carcinomas of the lung, breast, liver, biliary tract, gastrointestinal tract, head and neck, pancreas, prostate, cervix as well as multiple myeloma, melanoma, glioma, and glioblastomas.

Importantly, it should be pointed out that because of the chronic, and in some cases localized, nature of disorders or diseases mediated by overexpression of TGFβ and/or activin (e.g., fibrosis or cancers), small molecule treatments (such as treatment disclosed in the present invention) are favored for long-term treatment.

Not only are compounds of formula (I) useful in treating disorders or diseases mediated by high levels of TGFβ and/or activin activity, these compounds can also be used to prevent the same disorders or diseases. It is known that polymorphisms leading to increased TGFβ and/or activin production have been associated with fibrosis and hypertension. Indeed, high serum TGFβ levels are correlated with the development of fibrosis in patients with breast cancer who have received radiation therapy, chronic graft-versus-host-disease, idiopathic interstitial pneumonitis, veno-occlusive disease in transplant recipients, and peritoneal fibrosis in patients undergoing continuous ambulatory peritoneal dialysis. Thus, the levels of TGFβ and/or activin in serum and of TGFβ and/or activin mRNA in tissue can be measured and used as diagnostic or prognostic markers for disorders or diseases mediated by overexpression of TGFβ and/or activin, and polymorphisms in the gene for TGFβ that determine the production of TGFβ and/or activin can also be used in predicting susceptibility to disorders or diseases. See, e.g., Blobe, G.C. et al., *N. Engl. J. Med.* 342(18): 1350-1358 (2000); Matsuse, T. et al., *Am. J. Respir. Cell*

Mol. Biol. 13: 17-24 (1995); Inoue, S. et al., *Biochem. Biophys. Res. Comm.* 205: 441-448 (1994); Matsuse, T. et al, *Am. J. Pathol.* 148: 707-713 (1996); De Bleser et al., *Hepatology* 26: 905-912 (1997); Pawlowski, J.E., et al., *J. Clin. Invest.* 100: 639-648 (1997); and Sugiyama, M. et al., *Gastroenterology* 114: 550-558 (1998).

Administration of Compounds of formula (I)

As defined above, an effective amount is the amount required to confer a therapeutic effect on the treated patient. For a compound of formula (I), an effective amount can range, for example, from about 1 mg/kg to about 150 mg/kg (e.g., from about 1 mg/kg to about 100 mg/kg). Effective doses will also vary, as recognized by those skilled in the art, dependant on route of administration, excipient usage, and the possibility of co-usage with other therapeutic treatments including use of other therapeutic agents and/or radiation therapy.

Compounds of formula (I) can be administered in any manner suitable for the administration of pharmaceutical compounds, including, but not limited to, pills, tablets, capsules, aerosols, suppositories, liquid formulations for ingestion or injection or for use as eye or ear drops, dietary supplements, and topical preparations. The pharmaceutically acceptable compositions include aqueous solutions of the active agent, in an isotonic saline, 5% glucose or other well-known pharmaceutically acceptable excipient. Solubilizing agents such as cyclodextrins, or other solubilizing agents well-known to those familiar with the art, can be utilized as pharmaceutical excipients for delivery of the therapeutic compounds. As to route of administration, the compositions can be administered orally, intranasally, transdermally, intradermally, vaginally, intraaurally, intraocularly, buccally, rectally, transmucosally, or via inhalation, implantation (e.g., surgically), or intravenous administration. The compositions can be administered to an animal (e.g., a mammal such as a human, non-human primate, horse, dog, cow, pig, sheep, goat, cat, mouse, rat, guinea pig, rabbit, hamster, gerbil, or ferret, or a bird, or a reptile, such as a lizard).

Optionally, compounds of formula (I) can be administered in conjunction with one or more other agents that inhibit the TGFβ signaling pathway or treat the corresponding pathological disorders (e.g., fibrosis or progressive cancers) by way of a different mechanism of action. Examples of these agents include angiotensin converting enzyme

inhibitors, nonsteroid and steroid anti-inflammatory agents, as well as agents that antagonize ligand binding or activation of the TGFβ receptors, e.g., anti-TGFβ, anti-TGFβ receptor antibodies, or antagonists of the TGFβ type II receptors.

The invention will be further described in the following examples, which do not limit the scope of the invention described in the claims.

Synthesis of exemplary intermediates (IIa), (III), (IIIa), (IV), (V), and (VII) are described in Examples 1-4 below.

Example 1

(4-Formyl-cyclohexyl)-carbamic acid benzyl ester (VII)

Synthesis of the title compound is described in parts (a)-(c) below.

(a) 4-Benzyloxycarbonylamino-cyclohexanecarboxylic acid

Benzyl chloroformate (2.2 mL, 15.4 mmol) was added to a solution of 4-amino-cyclohexanecarboxylic acid (2 g, 14.0 mmol) in a mixture of 1,4-dioxane (5 mL) and saturated sodium bicarbonate aqueous solution (5 mL). The mixture was stirred at 0 °C for 3 hours. Dioxane was removed under reduced pressure. The residue was partitioned between ethyl acetate and water. The ethyl acetate solution was washed with brine, dried over sodium sulfate, filtered, and concentrated to give 2.3 g (59%) of 4-benzyloxycarbonylamino-cyclohexanecarboxylic acid as yellow oil. MS (ESP-) m/z 276.39 (M - 1). ^{1}H NMR (300 MHz, $CDCl_3$) δ 7.34 (m, 5H), 5.09 (s, 2H), 2.24 (m, 1H), 2.04 (m, 2H), 1.83 (m, 2H), 1.44 (m, 3H), 0.97 (m, 2H).

(b) (4-(Methoxy-methyl-carbamoyl)-cyclohexyl)-carbamic acid benzyl ester

Oxalyl chloride (0.796 mL, 9.1 mmol) was added slowly to a solution of 4-benzyloxycarbonylamino-cyclohexanecarboxylic acid (2.3 g, 8.3 mmil) in dichloromethane (20 mL). The mixture was stirred at room temperature under nitrogen for 1 hour. Solvent was removed under reduced pressure. *N,O*-Dimethylhydroxylamine hydrochloride (0.971 g, 9.96 mmol) in anhydrous pyridine (10 mL) was added to the reaction residue. The mixture was stirred at room temperature for 3 hours. Solvent was removed under reduced pressure, and the residue was partitioned between ethyl acetate and water. Ethyl acetate solution was washed with brine, dried over sodium sulfate, filtered, and concentrated to give 1.0 g (38%) of (4-(methoxy-methyl-carbamoyl)-cyclohexyl)-

carbamic acid benzyl ester as yellow oil. ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.36 (m, 5H), 4.59 (s, 2H), 3.88 (m, 1H), 3.70 (s, 3H), 3.17 (s, 3H), 2.76 (m, 1H), 1.86 (m, 2H), 1.66 (m, 6H).

(c) (4-Formyl-cyclohexyl)-carbamic acid benzyl ester

Diisobutylaluminum hydride (1.0 M solution, 6.24 mL, 6.24 mmol) was added slowly to a solution of (4-(methoxy-methyl-carbamoyl)-cyclohexyl)-carbamic acid benzyl ester

(1.0 g, 3.12 mmol) in anhydrous THF (20 mL) at –78 °C. The mixture was stirred at –78 °C for 1 hour. Water (2 mL) was added at 0°C. The mixture was partitioned between ethyl acetate and water. Ethyl acetate was washed with brine, dried over sodium sulfate, filtered and concentrated to give 0.60 g (74%) of (4-formyl-cyclohexyl)-carbamic acid benzyl ester as a yellow oil. ^{1}H NMR (400 MHz, $CDCl_3$) δ 9.66 (s, 1H), 7.36 (5H), 3.63 (m, 1H), 2.38 (m, 1H), 1.77 (m, 4H), 1.18 (m, 4H).

Example 2

Benzo[1,3]dioxole-5-carboxylic acid methoxy-methyl-amide (V)

Sodium hydroxide (12.0 g, 300 mmol) in water (15 mL) was added slowly to a solution of **piperonyl chloride** (5.55 g, 30 mmol) and *N,O*-dimethylhydroxylamine hydrochloride (3.53 g, 36 mmol) in acetonitrile (200 mL). The mixture was stirred at room temperature for 0.5 h. Acetonitrile was removed under reduced pressure, and the residue was partitioned between ethyl acetate and water. The organic layer was washed with brine, dried over sodium sulfate, filtered, and concentrated. Column chromatography on silica gel eluting with ethyl acetate:hexanes (30:70) gave 5.5 g (88%) of the title compound as a yellow oil. MS (ES^+) m/z 210.1 (M + 1). ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.34 (m, 1H), 7.26 (d, 1H, J = 1.3 Hz), 6.86 (d, 1H, J = 8.1 Hz), 6.05 (s, 2H), 3.61 (s, 3H), 3.38 (s, 3H).

Example 3A

6-Cyclopropyl-pyridine-2-carbaldehyde (IIa)

Synthesis of the title compound is described in parts (a)-(c) below.

(a) 2-Bromo-6-[1,3]dioxolan-2-yl-pyridine

A mixture of 6-bromo-pyridine-2-carbaldehyde (2.0 g, 10.75 mmol), ethylene glycol (3 mL, 53.75 mmol), and a catalytic amount of TsOH in toluene (50 mL) was heated to reflux with a Dean-Stark trap for 1.5 hours and cooled down to room temperature and concentrated in vacuo. The residue was purified on silica gel column with 2% EtOAc in CH_2Cl_2 to yield 2-bromo-6-[1,3]dioxolan-2-yl-pyridine as a colorless liquid (1.97 g, 80%).

(b) 2-Cyclopropyl-6-[1,3]dioxolan-2-yl-pyridine

To a solution of $ZnCl_2$ in THF (0.5 M, 25 mL) was added dropwise a solution of cyclopropylmagnesium bromide (0.5 M, 25 mL) at –78°C under nitrogen. The reaction mixture was then allowed to warm up to room temperature and stirred for an hour. The above mixture was then transferred to a sealed tube with 2-bromo-6-[1,3]dioxolan-2-yl-pyridine (1.9g, 8.25 mmole, see subpart (a) above) and $Pd(PPh_3)_4$ (0.4g, 0.35 mmole). TLC showed major formation of the product and some starting material. The mixture was then heated to 120°C for 2 hours and cooled down to room temperature and then worked up with EtOAc and saturated ammonium chloride and dried over $MgSO_4$. The residue from concentration was purified on silica gel column with 5% EtOAc in CH_2Cl_2 to yield 2-cyclopropyl-6-[1,3]dioxolan-2-yl-pyridine as a bright yellow liquid (0.96 g, 61%).

(c) 6-Cyclopropyl-pyridine-2-carbaldehyde

A mixture of 2-cyclopropyl-6-[1,3]dioxolan-2-yl-pyridine (0.9 g, see subpart (b) above) and a catalytic amount of TsOH hydrate in a mixture of acetone (10 mL) and water (2 mL) was heated to reflux overnight until most of the starting materials were consumed according to TLC. It was then cooled down to room temperature and concentrated. The residue was dissolved in diethyl ether and washed with saturated sodium carbonate, and then water, and then dried over $MgSO_4$ and concentrated. The concentrate was purified on silica gel column with 100% CH_2Cl_2 to yield 6-cyclopropyl-pyridine-2-carbaldehyde as a bright liquid (0.65 g, 94%). ^1H NMR ($CDCl_3$, 300 MHz), δ 9.90 (s, 1H), 7.58(m, 2H), 7.23 (m, 1H), 2.01 (m, 1H), 1.02-0.92 (m, 4H).

The titled aldehyde was converted to the corresponding N, P-acetal for ketone preparation according to Scheme 1b above.

Example 3B

1-Benzo[1,3]dioxol-5-yl-2-(6-methyl-pyridin-2-yl)-ethanone (III)

n-Butyllithium (2.5 M in hexanes, 13.8 mL, 34.4 mmol) was added slowly to a solution of diisopropylamine (4.53 mL, 32.3 mmol) in anhydrous THF (50 mL) at -78°C. After being stirred for 0.1 hour, the mixture was allowed to warm up to 0°C. Stirring continued for 0.5 hour. The mixture was then cooled to -78 °C and 2,6-lutidine (3.76 mL, 32.3 mmol) was added slowly. The mixture was allowed to warm up to 0°C and stirred for 0.5 hour. The mixture was then cooled to -78 °C before the slow addition of benzo[1,3]dioxole-5-carboxylic acid methoxy-methyl-amide (4.5 g, 21.5 mmol; see Example 2 above) in anhydrous THF (10 mL). The mixture was stirred at -78 °C for 0.5 hour, at 0 °C for 0.5 hour, and at room temperature for 2 hours. The mixture was then quenched with ammonium chloride aqueous solution and extracted with ethyl acetate. The extract was washed with brine, dried over sodium sulfate, filtered, and concentrated. After purification using column chromatography on silica gel (eluent: ethyl acetate (2): hexanes (8)), 4.8 g (87%) of 1-Benzo[1,3]dioxol-5-yl-2-(6-methyl-pyridin-2-yl)-ethanone as a yellow solid was obtained. MS (ESP^+) m/z 256.1 (M + 1). ^1H NMR (400 MHz, Methanol-d_4) δ 7.56 (t, 1H, J = 7.5 Hz), 7.39 (dd, 1H, J = 1.8 Hz, 8.3 Hz), 7.30 (dd, 1H, J = 0.5 Hz, 1.8 Hz), 6.93 (m, 1H), 6.83 (m, 2H), 5.98 (s, 2H), 4.87 (s, 2H), 2.50 (s, 3H).

Example 3C

1-(6-Methyl-pyridin-2-yl)-2-[1,2,4]triazolo[1,5-a]pyridin-6-yl-ethanone (IIIa)

Synthesis of the title compound is described in parts (a) and (b) below.

(a) [1,2,4]Triazolo[1,5-a]pyridine-6-carbaldehyde

To a solution of 6-iodo-[1,2,4]triazolo[1,5-a]pyridine (5.0 g, 20 mmol; prepared from 2-amino-5-iodopyridine (Aldrich-Sigma, St. Louis, MO) according to WO 01/62756) in anhydrous THF (300 mL) at 0°C was slowly added a solution of isopropylmagnesium bromide in THF (1 M, 31 mL, 31 mmol). The resulting milky suspension was stirred at 0°C. After an hour, DMF (6 mL, 50 mmol) was added to the suspension at 0°C and the suspension was allowed to warm up to room temperature and stirred for 4 additional hours. 100 mL of water was then added at room temperature and stirred for 1 hour. The resulting mixture was extracted with diethylether and washed with saturated Na_2CO_3. The extracts

were dried over $MgSO_4$ and concentrated. The residue was purified on a short silica gel cake with EtOAc to give [1,2,4]triazolo[1,5-a]pyridine-6-carbaldehyde as a light yellow solid (3g, 100%). ESP+ m/e 148.0. ^1H NMR ($CDCl_3$, 300 MHz), δ 10.03 (s, 1H), 9.10 (s, 1H), 8.49 (s, 1H), 8.02 (d, 1H), 7.82 (d, 1H).

(b) 1-(6-Methyl-pyridin-2-yl)-2-[1,2,4]triazolo[1,5-a]pyridin-6-yl-ethanone

To a solution of [1,2,4]triazolo[1,5-a]pyridine-6-carbaldehyde (3g, 20 mmol; see subpart (a) above) and [(6-methyl-pyridin-2-yl)-phenylamino-methyl]-phosphonic acid diphenyl ester (8.8g, 20 mmol; prepared from 6-methyl-pyridine-2-carboxaldehyde (Aldrich-Sigma, St. Louis, MO) according to *Tetrahedron Lett.* 39:1717-1720 (1998)) in a mixture of THF (40 mL) and iPrOH (10 mL) was added Cs_2CO_3 (8.6 g, 26 mmol) and the mixture was stirred at room temperature for overnight. A solution of 3N HCl (30 mL) was added dropwise to the above mixture and stirred for 1 hour. It was then diluted with MTBE (methyl t-butyl ether) and extracted with 1N HCl twice. The aqueous extracts were neutralized with ca. 50% KOH until pH 7-8 was reached and precipitates formed. The precipitates were collected, washed with water, and dried to yield 1-(6-methyl-pyridin-2-yl)-2-[1,2,4]triazolo[1,5-a]pyridin-6-yl-ethanone as an offwhite solid (2.9 g). The filtrates were extracted with EtOAc and dried over $MgSO_4$ and concentrated. The residue was recrystalized with $iPrOH/H_2O$ to yield more desired product (0.6 g). ESP+, m/e 253. ^1H NMR ($CDCl_3$, 300 MHz), δ 8.6 (s, 1H), 8.29 (s, 1H), 7.87 (d, 1H), 7.72 (t, 1H), 7.70 (d, 1H), 7.53 (dd, 1H), 7.36 (d, 1H), 4.61 (s, 2H), 2.66 (s, 3H).

Example 4

1-Benzo[1,3]dioxol-5-yl-2-(6-methyl-pyridin-2-yl)-ethane-1,2-dione 2-oxime (IV)

Sodium nitrite (0.405 g, 5.88 mmol) was added to a solution of 1-benzo[1,3]dioxol-5-yl-2-(6-methyl-pyridin-2-yl)-ethanone (1.0 g, 3.92 mmol; see Example 3B above) in a mixture of $HOAc/THF/H_2O$ (6:4:1, 22 mL). The mixture was stirred at 0°C for 1 hour and then at room temperature for 1 hour. Solvent was removed under reduced pressure. Residue was dissolved in water and NaOH (3N) was added until the pH value was more than 8. The aqueous solution was then extracted with ethyl acetate. The organic layer was washed with brine, dried over sodium sulfate, filtered, and concentrated to give 0.90 g (81%) of 1-Benzo[1,3]dioxol-5-yl-2-(6-methyl-pyridin-2-yl)-ethane-1,2-dione 2-oxime as

a yellow foam. MS (ESP^+) m/z 285.1 (M + 1). ^1H NMR (300 MHz, $CDCl_3$) δ 7.49 (m, 4H), 7.09 (d, 1H, J = 7.5 Hz), 6.81 (d, 1H, J = 7.8 Hz), 6.04 (s, 2H), 2.43 (s, 3H).

Synthesis of exemplary compounds of formula (I) are described in Examples 5-24 below.

Example 5

4-(4-Benzo[1,3]dioxol-5-yl-5-(6-methyl-pyridin-2-yl)-1H-imidazol-2-yl)-piperidine-1-carboxylic acid benzyl ester

4-Formyl-N-Cbz-piperidine (0.297 g, 1.2 mmol) was added to a solution of 1-benzo[1,3]dioxol-5-yl-2-(6-methyl-pyridin-2-yl)-ethane-1,2-dione 2-oxime (0.280 g, 1.0 mmol, see Example 4) and ammonium acetate (1.54 g, 20.0 mmol) in acetic acid (10 mL). The mixture was reflux for 2 hours. Solvent was removed under reduced pressure. The reaction mixture was then quenched with an ammonia/ice mixture. The aqueous solution was extracted with ethyl acetate. The extract was washed with brine, dried over sodium sulfate, filtered, and concentrated. HPLC purification eluting with acetonitrile:water gave 0.12 g (23%) of the hydroxyimidazole as a yellow solid. MS (ESP^+) m/z 513.2 (M+ 1)

The above mentioned hydroxyimidazole (0.50 g, 0.98 mmol) was added to a solution of $TiCl_3$/HCl (10%, 5 mL) and methanol (20 mL). The mixture was stirred at room temperature for 2 hours. Ammonia/ice mixture was added to quench the reaction. The aqueous solution was extracted with ethyl acetate. The ethyl acetate extract was washed with brine, dried over sodium sulfate, filtered, and concentrated. HPLC purification eluting with acetonitrile:water gave 0.16 g (33%) of the title compound as a yellow solid. MS (ESP^+) m/z 497.3 (M + 1). ^1H NMR (400 MHz, Methanol-d_4) δ 7.71 (t, 1H, J = 7.8 Hz), 7.35 (m, 6H), 7.26 (d, 1H, J = 7.8 Hz), 7.01 (m, 3H), 6.07 (s, 2H), 5.16 (s, 2H), 4.35 (m, 2H), 3.36 (m, 1H), 3.03 (m, 2H), 2.64 (s, 3H), 2.11 (m, 2H), 1.87 (m, 2H).

Example 6

4-(4-Benzo[1,3]dioxol-5-yl-5-pyridin-2-yl-1H-imidazol-2-yl)-piperidine-1-carboxylic acid benzyl ester

4-(4-Benzo[1,3]dioxol-5-yl-1-hydroxy-5-pyridin-2-yl-1H-imidazol-2-yl)-piperidine-1-carboxylic acid benzyl ester (0.9 g, 1.8 mmol), which was prepared with 4-

formyl-N-Cbz-piperidine and 1-benzo[1,3]dioxol-5-yl-2-(pyridin-2-yl)-ethane-1,2-dione 2-oxime in a similar manner as described in Example 5, was added to a solution of $TiCl_3$/HCl (10% 15 mL) and methanol (20 mL). The mixture was stirred at room temperature for 2 hours. Ammonia/ice mixture was added to quenched the reaction. The aqueous solution was extracted with ethyl acetate. Ethyl acetate extract was washed with brine, dried over sodium sulfate, filtered, and concentrated. Column chromatography on silica gel eluting with methanol:dichloromethane (5:95) gave 0.52 g (60%) of the title compound as a yellow foam. MS (ESP^+) m/z 483.02 (M + 1). ^1H NMR (400 MHz, $CDCl_3$) δ 8.50 (m, 1H), 7.50 (m, 2H), 7.34 (m, 5H), 7.09 (m, 3H), 6.85 (d, 1H, J = 7.9 Hz), 6.00 (s, 2H), 5.14 (s, 2H), 4.29 (m, 2H), 3.00 (m, 3H), 2.10 (m, 2H), 1.81 (m, 2H).

Example 7

3-[4-Benzo[1,3]dioxol-5-yl-5-(6-methyl-pyridin-2-yl)-1H-imidazol-2-yl]-piperidine-1-carboxylic acid benzyl ester

3-[4-Benzo[1,3]dioxol-5-yl-1-hydroxy-5-(6-methyl-pyridin-2-yl)-1H-imidazol-2-yl]-piperidine-1-carboxylic acid benzyl ester (0.50 g, 0.98 mmol), which was prepared with 3-formyl-N-Cbz-piperidine and 1-benzo[1,3]dioxol-5-yl-2-(6-methyl-pyridin-2-yl)-ethane-1,2-dione 2-oxime in a similar manner as described in Example 5, was added to a solution of $TiCl_3$/HCl (10% 5 mL) and methanol (20 mL). The mixture was stirred at room temperature for 2 hours. Ammonia/ice mixture was added to quench the reaction. The aqueous solution was extracted with ethyl acetate. Ethyl acetate extract was washed with brine, dried over sodium sulfate, filtered, and concentrated. HPLC purification eluting with acetonitrile:water gave 0.15 g (30%) of the title compound as a yellow solid. MS (ESP^+) m/z 497.2 (M + 1). ^1H NMR (400 MHz, Methanol-d_4) δ 7.78 (t, 1H, J = 7.9 Hz), 7.34 (m, 7H), 7.01 (m, 3H), 6.08 (s, 2H), 5.16 (s, 2H), 4.41 (m, 1H), 4.15 (m, 1H), 3.22 (m, 2H), 3.10 (m, 1H), 2.66 (s, 3H), 2.26 (m, 1H), 1.92 (m, 2H), 1.64 (m, 1H).

Example 8

3-[4-Benzo[1,3]dioxol-5-yl-5-(6-methyl-pyridin-2-yl)-1H-imidazol-2-yl]-pyrrolidine-1-carboxylic acid benzyl ester

3-[4-Benzo[1,3]dioxol-5-yl-1-hydroxy-5-(6-methyl-pyridin-2-yl)-1H-imidazol-2-yl]-pyrrolidine-1-carboxylic acid benzyl ester (0.180 g, 0.361 mmol), which was prepared with 3-formyl-N-Cbz-pyrrolidine and 1-benzo[1,3]dioxol-5-yl-2-(6-methyl-pyridin-2-yl)-ethane-1,2-dione 2-oxime in a similar manner as described in Example 5, was added to a solution of $TiCl_3$/HCl (10% 2 mL) and methanol (10 mL). The mixture was stirred at room temperature for 2 hours. Ammonia/ice mixture was added to quenched the reaction. The aqueous solution was extracted with ethyl acetate. Ethyl acetate extract was washed with brine, dried over sodium sulfate, filtered, and concentrated. HPLC purification eluting with acetonitrile:water gave 0.03 g (17%) of the title compound as a yellow solid. MS (ESP+) m/z 483.14 (M + 1). ^{1}H NMR (400 MHz, Methanol-d_4) δ 7.84 (t, 1H, J = 8.0 Hz), 7.37 (m, 7 H), 7.01 (m, 3H), 6.07 (s, 2H), 5.16 (s, 2H), 4.01 (m, 1H), 3.83 (m, 1H), 3.74 (m, 1H), 3.55 (m, 1H), 2.68 (s, 3H), 2.50 (m, 1H), 2.36 (m, 1H).

Example 9

2-(5-Benzo[1,3]dioxol-5-yl-2-piperidin-4-yl-3H-imidazol-4-yl)-6-methyl-pyridine

Palladium on activated carbon (0.010 g) was added to a solution of 4-(4-benzo[1,3]dioxol-5-yl-5-(6-methyl-pyridin-2-yl)-1H-imidazol-2-yl)-piperidine-1-carboxylic acid benzyl ester (0.100 g, 0.20 mmol; see Example 5) in methanol (5 mL). The reaction mixture was stirred under hydrogen atmosphere for 4 hours. The mixture was then filtered and concentrated to give 0.070 g (97%) of the title compound as a yellow oil. MS (ESP^+) m/z 363.2 (M + 1). ^{1}H NMR (300 MHz, $CDCl_3$) δ 7.41 (t, 1H, J = 7.8 Hz), 7.29 (d, 1H, J = 8.1 Hz), 7.10 (m, 2H), 6.92 (d, 1H, J = 7.5 Hz), 6.83 (m, 1H), 5.98 (s, 2H), 3.18 (m, 2H), 2.95 (m, 1H), 2.73 (m, 2H), 2.46 (s, 3H), 1.96 (m, 2H), 1.82 (m, 2H).

Example 10

2-[5-Benzo[1,3]dioxol-5-yl-2-(1-phenylmethanesulfonyl-piperidin-4-yl)-3H-imidazol-4-yl]-6-methyl-pyridine

α-Toluenesulfonyl chloride (0.032 g, 0.17 mmol) and diisopropylethylamine (0.036 mL, 0.21 mmol) were added to a solution of 2-(5-benzo[1,3]dioxol-5-yl-2-piperidin-4-yl-3H-imidazol-4-yl)-6-methyl-pyridine (0.050 g, 0.14 mmol; see Example 9) in anhydrous THF (3 mL). The reaction mixture was stirred at room temperature for 3 hours. Solvent

was removed under reduced pressure, and the residue was dissolved in 1 mL DMSO. The DMSO solution was filtered and injected onto preparative HPLC. HPLC purification eluting with acetonitrile:water gave 0.005 g (7%) of the title compound as a yellow solid. MS (ESP^+) m/z 517.2 (M + 1). ^1H NMR (400 MHz, Methanol-d_4) δ 7.73 (t, 1H, J = 7.7 Hz), 7.42 (m, 5H), 7.33 (d, 1H, J = 7.3 Hz), 7.27 (d, 1H, J = 7.3 Hz), 6.07 (s, 2H), 4.40 (s, 2H), 3.82 (m, 2H), 3.19 (m, 1H), 2.85 (m, 2H), 2.66 (s, 3H), 2.10 (m, 2H), 1.92 (m, 2H).

Example 11

2-[5-Benzo[1,3]dioxol-5-yl-2-(1-phenylmethanesulfonyl-piperidin-4-yl)-3H-imidazol-4-yl]-pyridine

α-Toluenesulfonyl chloride (0.023 g, 0.12 mmol) and diisopropylethylamine (0.026 mL, 0.15 mmol) were added to a solution of 2-(5-benzo[1,3]dioxol-5-yl-2-piperidin-4-yl-3H-imidazol-4-yl)-pyridine (0.035 g, 0.10 mmol, in 3 mL of anhydrous THF), which was prepared with 4-(4-benzo[1,3]dioxol-5-yl-5-pyridin-2-yl-1H-imidazol-2-yl)-piperidine-1-carboxylic acid benzyl ester in a similar manner as described in Example 9. The reaction mixture was stirred at room temperature for 3 hours. Solvent was removed under reduced pressure, and the residue was dissolved in 1 mL DMSO. The DMSO solution was filtered and injected onto preparative HPLC. HPLC purification eluting with acetonitrile:water gave 0.005 g (10%) of the title compound as a yellow solid. MS (ESP^+) m/z 503.1 (M + 1). ^1H NMR (400 MHz, Methanol-d_4) δ 8.67 (m, 1H), 7.82 (m, 1H), 7.42 (m. 7H), 7.02 (m, 3H), 6.07 (s, 2H), 4.38 (s, 2H), 3.81 (m, 2H), 3.17 (m, 1H), 2.85 (m, 1H), 2.10 (m, 2H), 1.90 (m, 2H).

Example 12

2-[5-Benzo[1,3]dioxol-5-yl-2-(1-methanesulfonyl-piperidin-4-yl)-3H-imidazol-4-yl]-pyridine

Methanesulfonyl chloride (0.009 mL, 0.12 mmol) and diisopropylethylamine (0.026 mL, 0.15 mmol) were added to a solution of 2-(5-benzo[1,3]dioxol-5-yl-2-piperidin-4-yl-3H-imidazol-4-yl)-pyridine (0.035 g, 0.10 mmol; prepared as described in Example 11) in anhydrous THF (3mL). The reaction mixture was stirred at room temperature for 3 hours. Solvent was removed under reduced pressure, and the residue

was dissolved in 1 mL DMSO. The DMSO solution was filtered and injected onto preparative HPLC. HPLC purification eluting with acetonitrile:water gave 0.012 g (28%) of the title compound as a yellow solid. MS (ESP^+) m/z 427.1 (M + 1). ^1H NMR (400 MHz, $CDCl_3$) δ 8.65 (m, 1H), 7.83 (m, 1H), 7.56 (m, 1H), 7.45 (m. 1H), 7.03 (dd, 1H, J = 1.8 Hz, 8.1 Hz), 6.97 (d, 1H, J = 1.8 Hz), 6.88 (d, 1H, d = 8.1 Hz), 6.05 (s, 2H), 3.91 (m, 2 H), 3.47 (m, 1H), 2.89 (m, 2H), 2.84 (s, 3H), 2.22 (m, 2H), 2.11 (m, 2H).

Example 13

2-[5-Benzo[1,3]dioxol-5-yl-2-(1-methanesulfonyl-piperidin-4-yl)-3H-imidazol-4-yl]-6-methyl-pyridine

Methanesulfonyl chloride (0.009 mL, 0.12 mmol) and diisopropylethylamine (0.026 mL, 0.15 mmol) were added to a solution of 2-(5-benzo[1,3]dioxol-5-yl-2-piperidin-4-yl-3H-imidazol-4-yl)-6-methyl-pyridine (0.036 g, 0.10 mmol; see Example 9) in anhydrous THF (3mL). The reaction mixture was stirred at room temperature for 3 hours. Solvent was removed under reduced pressure, and the residue was dissolved in 1 mL DMSO. The DMSO solution was filtered and injected onto preparative HPLC. HPLC purification eluting with acetonitrile:water gave 0.011 g (25%) of the title compound as a yellow solid. MS (ESP^+) m/z 441.2 (M + 1). ^1H NMR (400 MHz, Methanol-d_4) δ 7.74 (t, 1H, J = 7.9 Hz), 7.34 (m, 1H), 7.28 (m, 1H), 7.03 (m, 3H), 6.08 (s, 2H), 3.92 (m, 2H), 3.25 (m, 1H), 2.94 (m, 2H), 2.90 (s, 3H), 2.66 (s, 3H), 2.23 (m, 2H), 2.03 (m, 2H).

Example 14

4-(4-Benzo[1,3]dioxol-5-yl-5-pyridin-2-yl-1H-imidazol-2-yl)-piperidine-1-carboxylic acid 2-chloro-benzyl ester

2-Chlorobenzyl chloroformate (0.011 mL, 0.070 mmol) was added to a solution of 2-(5-benzo[1,3]dioxol-5-yl-2-piperidin-4-yl-3H-imidazol-4-yl)-pyridine (0.021 g, 0.059 mmol; prepared as described in Example 11) in a mixture of THF (3 mL) and 2 M sodium bicarbonate aqueous solution (0.3 mL). The mixture was stirred at room temperature for 2 hours. Mixture was partitioned between ethyl acetate and water. The organic solution was washed with brine, dried over sodium sulfate, filtered, and concentrated. HPLC purification eluting with acetonitrile:water gave 0.026 g (70%) of the title compound as a

yellow solid. MS (ESP^+) m/z 517.03 (M+1). ^1H NMR (400 MHz, $CDCl_3$) δ 8.60 (m, 1H), 7.81 (m, 1H), 7.60 (d, 1H, J = 8.2 Hz), 7.39 (m, 3H), 7.27 (m, 2H), 7.07 (dd, 1H, J = 8.1, 1.8 Hz), 6.99 (d, 1H, J = 1.8 Hz), 6.90 (d, 1H, J = 8.1 Hz), 6.05 (s, 2H), 5.24 (s, 2H), 4.36 (m, 2H), 3.48 (m, 1H), 2.98 (m, 2H), 2.17 (m, 2H), 1.86 (m, 2H).

Example 15

4-(4-Benzo[1,3]dioxol-5-yl-5-pyridin-2-yl-1H-imidazol-2-yl)-piperidine-1-carboxylic acid 2,4-dichloro-benzylamide

2,3-Dichlorobenzylisocyanate (0.009 mL, 0.07 mmol) was added to a solution of 2-(5-benzo[1,3]dioxol-5-yl-2-piperidin-4-yl-3H-imidazol-4-yl)-pyridine (0.021 g, 0.059 mmol; prepared as described in Example 11) and diisopropylethylamine (0.031 mL, 0.177 mmol) in anhydrous THF (5 mL). The mixture was stirred at room temperature for 2 hours and was partitioned between ethyl acetate and water. The organic solution was washed with brine, dried over sodium sulfate, filtered, and concentrated. HPLC purification eluting with acetonitrile:water gave 0.016 g (41%) of the title compound as a yellow solid. MS (ESP^+) m/z 550.2 (M+1). ^1H NMR (400 MHz, $CDCl_3$) δ 8.58 (m, 1H), 7.80 (m, 1H), 7.56 (d, 1H, J = 8.2 Hz), 7.39 (m, 1H), 7.32 (d, 1H, J = 2.1 Hz), 7.25 (d, 1H, J = 8.2 Hz), 7.14 (dd, 1H, J = 8.2, 2.0 Hz), 7.03 (dd, 1H, J = 8.1, 1.8 Hz), 6.95 (d, 1H, J = 1.6 Hz), 6.87 (d, 1H, J = 8.0 Hz), 6.04 (s, 2H), 4.38 (s, 2H), 4.11 (m, 2H), 3.48 (m, 1H), 2.99 (m, 2H), 2.14 (m, 2H), 1.92 (m, 2H).

Example 16

1-[4-(4-Benzo[1,3]dioxol-5-yl-5-pyridin-2-yl-1H-imidazol-2-yl)-piperidin-1-yl]-ethanone

Acetic anhydride (0.011 mL, 0.12 mmol) was added to a solution of 2-(5-benzo[1,3]dioxol-5-yl-2-piperidin-4-yl-3H-imidazol-4-yl)-pyridine (0.035 g, 0.10 mmol; prepared as described in Example 11) and diisopropylethylamine (0.021 mL, 0.12 mmol) in anhydrous THF (3 mL). The mixture was stirred at room temperature for 18 hours and was partitioned between ethyl acetate and water. The organic solution was washed with brine, dried over sodium sulfate, filtered, and concentrated. HPLC purification eluting with acetonitrile:water gave 0.010 g (26%) of the title compound as a yellow solid. MS (ESP^+)

m/z 391.2 (M + 1). ^{1}H NMR (400 MHz, Methanol-d_4) δ 8.59 (m, 1H), 7.73 (m, 1H), 7.34 (m, 2H), 6.94 (m, 3H), 5.98 (s, 2H), 4.83 (s, 3H), 4.60 (m, 2H), 4.01 (m, 2H), 3.28 (m, 3H), 2.69 (m, 2H).

Example 17

2-[5-Benzo[1,3]dioxol-5-yl-2-(1-furan-2-yl-methyl-piperidin-4-yl)-3H-imidazol-4-yl]-pyridine

Sodium triacetoxyborohydride (0.030 g, 0.14 mmol) was added to a solution of 2-(5-benzo[1,3]dioxol-5-yl-2-piperidin-4-yl-3H-imidazol-4-yl)-pyridine (0.035 g, 0.10 mmol; prepared as described in Example 11) and furan-2-carbaldehyde (0.0083 mL, 0.10 mmol) in dichloromethane (5 mL). The mixture was stirred at room temperature for 18 hours and was filtered and concentrated. HPLC purification eluting with acetonitrile:water gave 0.010 g (23%) of the title compound as a yellow solid. MS (ESP$^+$) m/z 429.1. ^{1}H NMR (400 MHz, DMSO-d_6) δ 8.67 (m, 1H), 7.87 (m, 2H), 7.44 (m, 2H), 7.09 (m, 3H), 6.73 (d, 1H, J = 3.2 Hz), 6.60 (m, 1H), 6.12 (s, 2H), 4.45 (s, 2H), 3.54 (m, 2H), 3.26 (m, 1H), 3.11 (m, 2H), 2.33 (m, 2H), 2.06 (m, 2H).

Example 18

{4-[4-Benzo[1,3]dioxol-5-yl-5-(6-methyl-pyridin-2-yl)-1H-imidazol-2-yl]-cyclohexyl}-carbamic acid benzyl ester

(4-Formyl-cyclohexyl)-carbamic acid benzyl ester (0.133 g, 0.507 mmol; see Example 1 above) was added to a solution of 1-benzo[1,3]dioxol-5-yl-2-(6-methyl-pyridin-2-yl)-ethane-1,2-dione 2-oxime (0.120 g, 0.422 mmol; see Example 4) and ammonium acetate (0.651 g, 8.44 mmol) in acetic acid (5 mL). The mixture was refluxed for 2 hours and solvent was removed under reduced pressure. The reaction mixture was then quenched with an ammonia/ice mixture. The aqueous solution was extracted with ethyl acetate. Ethyl acetate extract was washed with brine, dried over sodium sulfate, filtered, and concentrated. HPLC purification eluting with acetonitrile:water gave 0.035 g (16%) of the hydroxyimidazole as a yellow solid. MS (ESP$^+$) m/z 527.2 (M + 1).

The above mentioned hydroxyimidazole (0.100 g, 0.190 mmol) was added to a solution of $TiCl_3$/HCl (10% 2 mL) and methanol (10 mL). The mixture was stirred at

room temperature for 2 hours. Ammonia/ice mixture was added to quench the reaction. The aqueous solution was extracted with ethyl acetate. The ethyl acetate extract was washed with brine, dried over sodium sulfate, filtered, and concentrated. HPLC purification eluting with acetonitrile:water gave 0.015 g (15%) of the title compound as a yellow solid. MS (ESP^+) m/z 511.2 (M + 1). ^1H NMR (400 MHz, Methanol-d_4) δ 7.68 (m, 1H), 7.33 (m, 6H), 7.22 (m, 1H), 7.01 (m, 3H), 6.07 (s, 2H), 5.08 (s, 2H), 3.52 (m, 1H), 3.09 (m, 1H), 2.66 (s, 3H), 2.16 (m, 3H), 1.98 (m, 1H), 1.83 (m, 2H), 1.44 (m, 2H).

Example 19

4-[4-Benzo[1,3]dioxol-5-yl-5-(6-methyl-pyridin-2-yl)-1H-imidazol-2-yl] cyclohexylamine

Palladium on activated carbon (0.017 g) was added to a solution of {4-[4-Benzo[1,3]dioxol-5-yl-5-(6-methyl-pyridin-2-yl)-1H-imidazol-2-yl]-cyclohexyl}-carbamic acid benzyl ester (see Example 18; 0.370 g, 0.725 mmol) in methanol (5 mL). The reaction mixture was stirred under hydrogen atmosphere for 4 hours. The mixture was then filtered and concentrated to give 0.250 g (92%) of the title compound as a yellow oil. MS (ESP^+) m/z 377.2 (M + 1). ^1H NMR (300 MHz, Methanol-d_4) δ 7.80 (t, 1H, J = 7.8 Hz), 7.36 (m, 2H), 7.01 (m, 3H), 6.07 (s, 2H), 3.47 (m, 1H), 3.32 (m, 1H), 2.29 (m, 2H), 2.03 (m, 4H), 1.90 (m, 2H).

Example 20

N-{4-[4-Benzo[1,3]dioxol-5-yl-5-(6-methyl-pyridin-2-yl)-1H-imidazol-2-yl]-cyclohexyl}-C-phenyl-methanesulfonamide

α-Toluenesulfonyl chloride (0.023 g, 0.12 mmol) and diisopropylethylamine (0.026 mL, 0.15 mmol) were added to a solution of 4-[4-benzo[1,3]dioxol-5-yl-5-(6-methyl-pyridin-2-yl)-1H-imidazol-2-yl] cyclohexylamine (see Example 19; 0.038 g, 0.10 mmol) in anhydrous THF (3 mL). The reaction mixture was stirred at room temperature for 3 hours. Solvent was removed under reduced pressure, and the residue was dissolved in 1 mL DMSO. The DMSO solution was filtered and injected onto preparative HPLC. HPLC purification eluting with acetonitrile:water gave 0.005 g (9%) of the title compound as a yellow solid. MS (ESP^+) m/z 531.1 (M + 1). ^1H NMR (400 MHz, Methanol-d_4) δ 7.67

(m, 1H), 7.41 (m, 6H), 7.30 (m, 1H), 7.22 (m, 1H), 7.01 (m, 2H), 6.07 (s, 2H), 4.34 (s, 2H), 3.05 (m, 2H), 2.63 (s, 3H), 2.13 (m, 2H), 1.95 (m, 2H), 1.72 (m, 2H), 1.43 (m, 2H).

Example 21

4-[4-Benzo[1,3]dioxol-5-yl-5-(6-methyl-pyridin-2-yl)-1H-imidazol-2-yl]-bicyclo[2.2.2]octane-1-carboxylic acid methyl ester

4-Formyl-bicyclo[2.2.2]octane-1-carboxylic acid methyl ester (0.284 g, 1.0 mmol) was added to a solution of 1-benzo[1,3]dioxol-5-yl-2-(6-methyl-pyridin-2-yl)-ethane-1,2-dione 2-oxime (see Example 4; 0.215 g, 1.1 mmol) and ammonium acetate (1.54 g, 20 mmol) in acetic acid (5 mL). The mixture was refluxed for 2 hours. Solvent was removed under reduced pressure. The reaction mixture was then quenched with ammonia/ice mixture. The aqueous solution was extracted with ethyl acetate. Ethyl acetate extract was washed with brine, dried over sodium sulfate, filtered, and concentrated to give 0.300g (65%) of the hydroxyimidazole as a yellow solid. MS (ESP^+) m/z 462.3 (M + 1).

The above mentioned hydroxyimidazole (0.250 g, 0.54 mmol) was added to a solution of $TiCl_3$/HCl (10% 3 mL) and methanol (10 mL). The mixture was stirred at room temperature for 2 hours. Ammonia/ice mixture was added to quench the reaction. The aqueous solution was extracted with ethyl acetate. Ethyl acetate extract was washed with brine, dried over sodium sulfate, filtered, and concentrated. HPLC purification eluting with acetonitrile:water gave 0.100 g (42%) of the title compound as a yellow solid. MS (ESP^+) m/z 446.2 (M + 1). ^1H NMR (400 MHz, Methanol-d_4) δ 7.72 (t, 1H, J = 7.8 Hz), 7.34 (d, 1H, J = 7.7 Hz), 7.22 (d, 1H, J = 7.9 Hz), 6.97 (m, 3H), 6.05 (s, 2H), 3.67 (s, 3H), 2.64 (s, 3H), 2.10 (m, 6H), 1.99 (m, 6H).

Example 22

4-[4-Benzo[1,3]dioxol-5-yl-5-(6-methyl-pyridin-2-yl)-1H-imidazol-2-yl]-bicyclo[2.2.2]octane-1-carboxylic acid

Lithium hydroxide monohydrate (0.020 g, 0.487 mmol) was added to a solution of 4-[4-benzo[1,3]dioxol-5-yl-5-(6-methyl-pyridin-2-yl)-1H-imidazol-2-yl]-bicyclo[2.2.2]octane-1-carboxylic acid methyl ester (see Example 21; 0.150 g, 0.325 mmol) in a mixture of THF/MeOH/H_2O (2/1/1, 4 mL). The mixture was stirred for 3

hours. Solvent was removed. Residue was diluted with water (30 mL). Citric acid was added to the solution to make the pH lower than 7. The aqueous solution was extracted with ethyl acetate. Ethyl acetate extract was washed with brine, dried over sodium sulfate, filtered and concentrated to give 0.140 g (99%) of the title compound as a yellow solid. MS (ESP^+) m/z 432.2 (M + 1). ^1H NMR (400 MHz, Methanol-d_4) δ 7.72 (m, 1H), 7.33 (d, 1H, J = 7.7 Hz), 7.22 (d, 1H, J = 7.7 Hz), 6.98 (m, 3H), 6.05 (s, 2H), 2.64 (s, 3H), 2.11 (m, 6H), 1.99 (m, 6H).

Example 23

{4-[4-Benzo[1,3]dioxol-5-yl-5-(6-methyl-pyridin-2-yl)-1H-imidazol-2-yl]-bicyclo[2.2.2]oct-1-yl}-carbamic acid benzyl ester

Diphenylphosphoryl azide (0.070 mL, 0.324 mmol) was added to a solution of 4-[4-benzo[1,3]dioxol-5-yl-5-(6-methyl-pyridin-2-yl)-1H-imidazol-2-yl]-bicyclo[2.2.2]octane-1-carboxylic acid (see Example 22; 0.140 g, 0.324 mmol) and diisopropylethylamine (0.068 mL, 0.39 mmol) in toluene (5 mL). The mixture was stirred for 2 hours. Benzyl alcohol (0.067 mL, 0.648 mmol) was added to the mixture. The mixture was stirred at room temperature for 18 hours. Solvent was removed. The mixture was partitioned between ethyl acetate and water. The organic solution was washed with brine, dried over sodium sulfate, filtered, and concentrated. HPLC purification eluting with acetonitrile:water gave 0.002 g (1%) of the title compound as a yellow solid. MS (ESP^+) m/z 537.4 (M + 1). ^1H NMR (400 MHz, Methanol-d_4) δ 7.71 (m, 1H), 7.33 (m, 5H), 7.22 (m, 2H), 6.97 (m, 3H), 6.05 (s, 2H), 5.02 (s, 2H), 2.63 (s, 3H), 2.17 (m, 6H), 2.06 (m, 6H).

Example 24

4-[4-Benzo[1,3]dioxol-5-yl-5-(6-ethyl-pyridin-2-yl)-1H-imidazol-2-yl]-piperidine-1-carboxylic acid benzyl ester

To a solution of 4-[4-benzo[1,3]dioxol-5-yl-5-(6-bromo-pyridin-2-yl)-1H-imidazol-2-yl]-piperidine-1-carboxylic acid benzyl ester (prepared in accordance with Scheme 1b with 6-bromo-piperidine-2-carbaldehyde as the starting material; 100 mg, 0.18 mmol) in DMF (1 mL) and triethylamine (2 mL) under nitrogen, was added $PdCl_2(PPh_3)_2$ (2 mg, 0.005 mmol) and CuI (2 mg, 0.01 mmol), then followed with trimethylsilylacetylene (30

uL, 0.20 mmol). The mixture was stirred at room temperature for 4 hours until LC-MS showed complete coupling. Diethyl ether (30 mL) was added and the precipitate was filtered off. The clear solution was washed with saturated aqueous NH_4Cl, then 0.5M EDTA solution, and water, and then dried ($MgSO_4$). Concentration gave a yellow syrup that was dissolved in THF (20 mL). The solution was cooled to 0°C and tetrabutylammonium fluoride (2 mL, 1 M in THF) was added. The mixture was stirred at room temperature for 30 minutes until LC-MS indicated complete removal of the silyl group. The reaction mixture was then concentrated in vacuum and passed through a short silica gel column with ethyl acetate/dichloromethane (1:1). The purified material was dissolved in ethanol (20 mL) and PtO_2 (50 mg) was added. The mixture was stirred under hydrogen (1 atm) at room temperature for 3 days until LC-MS showed major conversion of the alkyne to the correponding alkane. The solids were filtered off and the filtrates were concentrated and purified on preparative HPLC to give the title compound (3 mg, 3 %) as a TFA salt. MS (EPS^+: 511.3 (MH^+)). ^1H NMR (400 MHz, MeOH-d4) δ 7.60 (t, 1H), 7.39-7.29 (m, 5H), 7.23 (d, 1H), 7.13 (d, 1H), 6.93 (dd, 1H), 6.91 (dd, 1H), 6.81 (d, 1H), 5.95 (s, 2H), 5.14 (s, 2H), 4.28 (d(br), 2H), 3.04 (m, 1H), 3.02 (br, 2H), 2.79 (q, 2H), 2.00 (d(br), 2H), 1.85 (ddd, 2H), 1.28 (t, 3H)

The compounds listed in the following Table were prepared in an analogous manner to those described in the methods and examples above. The mass spectroscopy data of these compounds are included in the Table.

Example	Chemical Name	^{1}H-NMR	MS (ES +) m/z (M +1)
Example 25	2-(5-Benzo[1,3]dioxol-5-yl-2-piperidin-4-yl-3H-imidazol-4-yl)-pyridine	(400 MHz, DMSO-d6), δ 8.67 (d, 1H), 7.90 (t, 1H), 7.47(d, 1H), 7.44 (d, 1H), 7.14 (s, 1H), 7.07 (s, 2H), 6.12 (s, 2H), 3.43 (d, 2H), 3.31 (t, 1H), 3.07 (q, 2H), 2.23 (d, 2H), 2.01 (q, 2H)	349.4
Example 26	4-(4-Benzo[1,3]dioxol-5-yl-5-pyridin-2-yl-1H-imidazol-2-yl)-piperidine-1-carboxylic acid 4-nitro-benzyl ester	^{1}H NMR (400 MHz, $CDCl_3$): δ 8.64 (d, 1H), 8.22 (d, 2H), 7.96 (m, 1H), 7.65 (d, 1H), 7.54 (3H), 6.95 (m, 5H), 6.05 (s, 2H), 5.24 (s, 2H), 4.35 (m, 2H), 3.45 (m, 1H), 2.97 (m, 2H), 2.16 (m, 2H), 1.92 (m, 2H).	528.09
Example 27	4-(4-Benzo[1,3]dioxol-5-yl-5-pyridin-2-yl-1H-imidazol-2-yl)-piperidine-1-carboxylic acid 4,5-dimethoxy-2-nitro-benzyl ester	^{1}H NMR (400 MHz, $CDCl_3$): δ 8.64 (d, 1H), 7.93 (t, 1H), 7.68 (s, 1H), 7.64 (d, 1H), 7.53 (m, 1H), 7.04 (dd, 1H), 6.98 (s, H), 6.96 (d, 1H), 6.90 (d, 1H), 6.06 (s, 2H), 5.51 (s, 2H), 4.34 (m, 2H), 3.97 (s, 3H), 3.95 (s, 3H), 3.50 (m, 1H), 3.00 (m, 2H), 2.16 (m, 2H), 1.92 (m, 2H).	588.13
Example 28	4-(4-Benzo[1,3]dioxol-5-yl-5-pyridin-2-yl-1H-imidazol-2-yl)-piperidine-1-carboxylic acid 3-fluoro-benzylamide	^{1}H NMR (400 MHz, $CDCl_3$): δ 8.59 (d, 1H), 7.74 (m, 1H), 7.5 (m, 1H), 7.36 (m, 1H), 7.20 (m, 1H), 6.94 (m, 6H), 6.02 (s, 2H), 4.29 (s, 2H), 4.13 (m, 2H), 3.44 (m, 1H), 2.95 (m, 2H), 2.08 (m, 2H), 1.89 (m, 2H).	500.05
Example 29	4-(4-Benzo[1,3]dioxol-5-yl-5-pyridin-2-yl-1H-imidazol-2-yl)-piperidine-1-carboxylic acid 4-fluoro-benzylamide	^{1}H NMR (400 MHz, $CDCl_3$): δ 8.57 (d, 1H), 7.76 (m, 1H), 7.53 (d, 1H), 7.35 (m, 1H), 7.17 (m, 1H), 6.95 (m, 6H), 6.02 (s, 2H), 4.27 (s, 2H), 4.13 (m, 2H), 3.44 (m, 1H), 2.95 (m, 2H), 2.08 (m, 2H), 1.89 (m, 2H).	500.2
Example 30	4-(4-Benzo[1,3]dioxol-5-yl-5-pyridin-2-yl-1H-imidazol-2-yl)-piperidine-1-carboxylic acid benzylamide	^{1}H NMR (400 MHz, $CDCl_3$): δ 8.57 (d, 1H), 7.70 (m, 1H), 7.50 (d, 1H), 7.23 (m, 6H), 7.03 (d, 1H), 6.96 (d, 1H), 6.84 (d, 1H), 6.00 (s, 2H), 4.27 (s, 2H), 4.09 (m, 2H), 3.45 (m, 1H), 2.93 (m, 2H), 2.05 (m, 2H), 1.87 (m, 2H).	482.07

Example 31	2-{5-Benzo[1,3]dioxol-5-yl-2-[1-(toluene-4-sulfonyl)-piperidin-4-yl]-3H-imidazol-4-yl}-pyridine	^{1}H NMR (400 MHz, $CDCl_3$): δ 8.53 (d, 1H), 7.80 (m, 1H), 7.65 (d, 2H), 7.57 (d, 1H), 7.41 (m, 1H), 7.37 (d, 2H), 7.04 (m, 1H), 6.96 (m, 1H), 6.87 (d, 1H).6.04 (s, 2H), 3.95 (m, 2H), 3.28 (m, 1H), 2.46 (s, 3H), 2.41 (m, 2H), 2.24 (m, 2H), 2.10 (m, 2H).	503.2
Example 32	4-(4-Benzo[1,3]dioxol-5-yl-5-pyridin-2-yl-1H-imidazol-2-yl)-piperidine-1-carboxylic acid 4-methyl-benzylamide	^{1}H NMR (400 MHz, $CDCl_3$): δ 8.59 (d, 1H), 7.77 (t, 1H), 7.52 (d, 1H), 7.37 (t, 1H), 7.10 (m, 4H), 7.01 (dd, 1H), 6.93 (d, 1H), 6.85 (d, 1H), 6.02 (s, 2H), 4.24 (s, 2H), 4.09 (m, 2H), 3.45 (m, 1H), 2.94 (m, 2H), 2.29 (s, 3H), 2.08 (m, 2H), 1.91 (m, 2H).	496.3
Example 33	4-(4-Benzo[1,3]dioxol-5-yl-5-pyridin-2-yl-1H-imidazol-2-yl)-piperidine-1-carboxylic acid 4-methoxy-benzylamide	^{1}H NMR (400 MHz, $CDCl_3$): δ 8.60 (d, 1H), 7.77 (m, 1H), 7.55 (d, 1H), 7.37 (m, 2H), 7.12 (d, 1H), 7.04 (m, 1H), 6.96 (m, 1H), 6.83 (m, 3H), 6.03 (s, 2H), 4.25 (s, 2H), 4.08 (m, 2H), 3.77 (s, 3H), 3.48 (m, 1H), 2.96 (m, 2H), 2.11 (m, 2H), 1.91 (m, 2H).	512.3
Example 34	4-(4-Benzo[1,3]dioxol-5-yl-5-pyridin-2-yl-1H-imidazol-2-yl)-piperidine-1-carboxylic acid 2-chloro-benzylamide	^{1}H NMR (400 MHz, $CDCl_3$): δ 8.56 (d, 1H), 7.72 (m, 1H), 7.51 (d, 1H), 7.28 (m, 3H), 7.14 (m, 2H), 7.02 (dd, 1H), 6.95 (m, 1H), 6.84 (d, 1H), 6.01 (s, 2H), 4.37 (s, 2H), 4.10 (m, 2H), 3.47 (m, 1H), 2.95 (m, 2H), 2.08 (m, 2H), 1.91 (m, 2H).	516.2
Example 35	4-[4-(4-Benzo[1,3]dioxol-5-yl-5-pyridin-2-yl-1H-imidazol-2-yl)-piperidine-1-sulfonyl]-benzoic acid		533.1
Example 36	4-(4-Benzo[1,3]dioxol-5-yl-5-pyridin-2-yl-1H-imidazol-2-yl)-piperidine-1-carboxylic acid amide		392.1
Example 37	4-[4-(4-Benzo[1,3]dioxol-5-yl-5-pyridin-2-yl-1H-imidazol-2-yl)-piperidine-1-sulfonyl]-benzonitrile	^{1}H NMR (400 MHz, $CDCl_3$): δ 8.60 (d, 1H), 7.87 (m, 5H), 7.62 (d, 1H), 7.49 (m, 1H), 7.02 (dd, 1H), 6.94 (d, 1H), 6.89 (d, 1H), 6.05 (s, 2H), 3.97 (m, 2H), 3.30 (m, 1H), 2.56 (m, 2H), 2.25 (m, 2H), 2.05 (m,2 H).	514.1

Example 38	2-{5-Benzo[1,3]dioxol-5-yl-2-[1-(4-chloro-benzenesulfonyl)-piperidin-4-yl]-3H-imidazol-4-yl}-pyridine	^{1}H NMR (400 MHz, $CDCl_3$): δ 8.56 (d, 1H), 7.81 (m, 1H), 7.70 (d, 2H), 7.59 (d, 1H), 7.55 (d, 2H), 7.41 (m, 1H), 7.04 (dd, 1H), 6.96 (d, 1H), 6.88 (d, 1H), 6.04 (s, 2H), 3.94 (m, 2H), 3.30 (m, 1H), 2.49 (m, 2H), 2.25 (m, 2H), 2.05 (m,2 H).	523.1
Example 39	2-{5-Benzo[1,3]dioxol-5-yl-2-[1-(3,4-dichloro-benzenesulfonyl)-piperidin-4-yl]-3H-imidazol-4-yl}-pyridine	^{1}H NMR (400 MHz, $CDCl_3$): δ 8.57 (d, 1H), 7.84 (d, 1H), 7.81 (d, 1H), 7.65 (d, 1H), 7.58 (m, 2H), 7.42 (m, 1H), 7.03 (dd, 1H), 6.96 (d, 1H), 6.88 (d, 1H), 6.04 (s, 2H), 3.95 (m, 2H), 3.31 (m, 1H), 2.53 (m, 2H), 2.27 (m, 2H), 2.07 (m,2 H).	557.1
Example 40	{5-[4-(4-Benzo[1,3]dioxol-5-yl-5-pyridin-2-yl-1H-imidazol-2-yl)-piperidine-1-sulfonyl]-naphthalen-1-yl}-dimethyl-amine	^{1}H NMR (400 MHz, $CDCl_3$): δ 8.61 (m, 2H), 8.56 (m, 1H), 8.26 (d, 1H), 7.80 (m, 1H), 7.66 (m, 2H), 7.52 (m, 2H), 7.39 (m, 1H), 6.95 (dd, 1H), 6.88 (d, 1H), 6.82 (d, 1H), 6.01 (s, 2H), 3.98 (m, 2H), 3.27 (m, 1H), 2.75 (m, 2H), 2.09 (m, 2H), 1.92 (m, 2H).	582.1
Example 41	2-{5-Benzo[1,3]dioxol-5-yl-2-[1-(pyridin-4-yl-methyl)-piperidin-4-yl)]-3H-imidazol-4-yl}-pyridine	^{1}H NMR (400 MHz, $CDCl_3$): δ 8.82 (d, 2H), 8.66 (m, 1H), 7.88 (d, 2H), 7.78 (t, 1H), 7.58 (d, 1H), 7.37 (m, 1H), 7.06 (dd, 1H), 6.98 (d, 1H), 6.91 (d, 1H), 6.06 (s, 2H), 4.43 (s, 2H), 4.02 (m, 1H), 358 (m, 2H), 3.38 (m, 2H), 2.30 (m, 2H), 1.25 (m, 1H), 0.84 (m, 1H).	440.1
Example 42	2-{5-Benzo[1,3]dioxol-5-yl-2-[1-(propane-2-sulfonyl)-piperidin-4-yl]-3H-imidazol-4-yl}-pyridine	^{1}H NMR (400 MHz, MDSO-d_6): δ 8.70 (d, 1H), 7.88 (t, 1H), 7.46 (m, 2H), 7.13 (m, 3H), 6.14 (s, 2H), 3.80 (m, 2H), 3.36 (m, 1H), 3.24 (m, 1H), 3.05 (m, 2H), 2.06 (m, 2H), 1.95 (m, 2H), 1.24 (d, 6H).	455.0
Example 43	2-{5-Benzo[1,3]dioxol-5-yl-2-[1-(4-methoxy-benzenesulfonyl)-piperidin-4-yl]-3H-imidazol-4-yl}-pyridine	^{1}H NMR (400 MHz, Methanol-d_4): δ 8.67 (m, 1H), 7.83 (m, 1H), 7.75 (d, 2H), 7.45 (m, 2H), 7.15 (d, 2H), 7.02 (m, 3H), 6.08 (s, 2H), 3.91 (m, 2H), 3.90 (s, 3H), 3.04 (m, 1H), 2.41 (m, 2H), 2.17 (m, 2H), 2.04 (m, 2H).	519.1

Example 44	1-{4-[4-(4-Benzo[1,3]dioxol-5-yl-5-pyridin-2-yl-1H-imidazol-2-yl)-piperidine-1-sulfonyl]-phenyl}-ethanone	^{1}H NMR (400 MHz, MDSO-d_6): δ 8.70 (d, 1H), 8.21 (d, 2H), 7.94 (d, 2H), 7.88 (t, 1H), 7.44 (m, 2H), 7.08 (m, 3H), 6.13 (s, 2H), 3.85 (m, 2H), 3.07 (m, 1H), 2.67 (s, 3H), 2.44 (m, 2H), 2.12 (m, 2H), 1.99 (m, 2H).	531.0
Example 45	2-{5-Benzo[1,3]dioxol-5-yl-2-[1-(4-methyl-benzyl)-piperidin-4-yl]-3H-imidazol-4-yl}-pyridine	^{1}H NMR (400 MHz, MDSO-d_6): δ 8.67 (d, 1H), 7.88 (t, 1H), 7.43 (m, 4H), 7.29 (d, 2H), 7.08 (m, 3H), 6.11 (s, 2H), 4.31 (s, 2H), 3.49 (m, 2H), 3.26 (m, 1H), 3.10 (m, 2H), 2.35 (s, 3H), 2.29 (m, 2H), 2.06 (m, 2H).	453.2
Example 46	2-{5-Benzo[1,3]dioxol-5-yl-2-[1-(3-fluoro-5-trifluoromethyl-benzyl)-piperidin-4-yl]-3H-imidazol-4-yl}-pyridine	^{1}H NMR (400 MHz, MDSO-d_6): δ 8.66 (d, 1H), 7.85 (m, 3H), 7.75 (d, 1H), 7.44 (m, 1H), 7.10 (m, 3H), 6.11 (s, 2H), 4.45 (s, 2H), 3.55 (m, 2H), 3.27 (m, 1H), 3.12 (m, 2H), 2.31 (m, 2H), 2.08 (m, 2H).	525.1
Example 47	2-[5-Benzo[1,3]dioxol-5-yl-2-(1-cyclohexylmethyl-piperidin-4-yl)-3H-imidazol-4-yl]-pyridine		445.3
Example 48	2-[4-(4-Benzo[1,3]dioxol-5-yl-5-pyridin-2-yl-1H-imidazol-2-yl)-piperidin-1-ylmethyl]-cyclopropanecarboxylic acid ethyl ester	^{1}H NMR (400 MHz, MDSO-d_6): δ 8.69 (d, 1H), 7.90 (t, 1H), 7.47 (m, 2H), 7.11 (m, 3H), 6.12 (s, 2H), 4.10 (m, 2H), 3.68 (m, 2H), 3.20 (m, 5H), 2.35 (m, 2H), 2.11 (m, 2H), 1.81 (m, 1H), 1.66 (m, 1H), 1.20 (m, 4H), 1.06 (m, 1H).	475.2
Example 49	2-[4-(4-Benzo[1,3]dioxol-5-yl-5-pyridin-2-yl-1H-imidazol-2-yl)-piperidin-1-ylmethyl]-pyrrolidine-1-carboxylic acid tert-butyl ester	^{1}H NMR (400 MHz, MDSO-d_6): δ 8.69 (d, 1H), 7.91 (t, 1H), 7.47 (m, 2H), 7.10 (m, 3H), 6.12 (s, 2H), 4.24 (m, 2H), 3.29 (m, 8H), 2.33 (m, 2H), 1.97 (m, 6H), 1.43 (s, 9H).	532.3
Example 50	2-{5-Benzo[1,3]dioxol-5-yl-2-[1-(2,2-dimethyl-[1,3]dioxolan-4-ylmethyl)-piperidin-4-yl]-3H-imidazol-4-yl}-pyridine	^{1}H NMR (400 MHz, MDSO-d_6): δ 8.66 (d, 1H), 8.00 (m, 1H), 7.57 (m, 2H), 7.02 (m, 3H), 6.08 (s, 2H), 4.59 (m, 1H), 4.23 (m, 1H), 3.94 (m, 1H), 3.80 (m, 1H), 3.70 (m, 2H), 3.41 (m, 2H), 3.27 (m, 2H), 2.42 (m, 2H), 2.28 (m, 2H), 1.47 (s, 3H), 2.25 (m, 3H).	463.11

Example 51	2-[5-Benzo[1,3]dioxol-5-yl-2-(1-ethanesulfonyl-piperidin-4-yl)-3H-imidazol-4-yl]-pyridine	^{1}H NMR (400 MHz, $CDCl_3$): δ 8.63 (d, 1H), 7.84 (t, 1H), 7.61 (d, 1H), 7.44 (m, 1H), 7.07 (dd, 1H), 6.99 (d, 1H), 6.91 (d, 1H), 6.06 (s, 2H), 3.97 (m, 2H), 3.52 (m, 1H), 3.02 (m, 4H), 2.23 (m, 2H), 2.03 (m, 2H), 1.37 (t, 3H).	441.1
Example 52	2-{5-Benzo[1,3]dioxol-5-yl-2-[1-(butane-1-sulfonyl)-piperidin-4-yl]-3H-imidazol-4-yl}-pyridine	^{1}H NMR (400 MHz, $CDCl_3$): δ 8.63 (d, 1H), 7.83 (t, 1H), 7.59 (d, 1H), 7.44 (m, 1H), 7.06 (dd, 1H), 6.98 (d, 1H), 6.90 (d, 1H), 6.05 (s, 2H), 3.96 (m, 2H), 3.53 (m, 1H), 2.94 (m, 4H), 2.22 (m, 2H), 2.02 (m, 2H), 1.77 (m, 2H), 1.45 (m, 2H), 0.95 (t, 3H).	469.2
Example 53	2-{5-Benzo[1,3]dioxol-5-yl-2-[1-(2-nitro-phenylmethanesulfonyl)-piperidin-4-yl]-3H-imidazol-4-yl}-pyridine	^{1}H NMR (400 MHz, $CDCl_3$): δ 8.62 (d, 1H), 8.04 (d, 1H), 7.81 (m, 1H), 7.67 (t, 1H), 7.58 (m, 3H), 7.41 (m, 1H), 7.06 (dd, 1H), 6.99 (d, 1H), 6.91 (d, 1H), 6.05 (s, 2H), 4.79 (s, 2H), 3.77 (m, 2H), 3.47 (m, 1H), 2.90 (m, 2H), 2.16 (m, 2H), 1.92 (m, 2H).	548.1
Example 54	2-{5-Benzo[1,3]dioxol-5-yl-2-[1-(2-phenyl-ethenesulfonyl)-piperidin-4-yl]-3H-imidazol-4-yl}-pyridine	^{1}H NMR (400 MHz, $CDCl_3$): δ 8.62 (d, 1H), 7.82 (t, 1H), 7.60 (d, 1H), 7.50 (m, 3H), 7.44 (m, 4H), 7.05 (m, 1H), 6.98 (m, 1H), 6.88 (d, 1H), 6.70 (d, 1H), 6.01 (s, 2H), 3.94 (m, 2H), 3.45 (m, 1H), 2.85 (m, 2H), 2.27 (m, 2H), 2.10 (m, 2H).	515.2
Example 55	2-{5-Benzo[1,3]dioxol-5-yl-2-[1-(propane-1-sulfonyl)-piperidin-4-yl]-3H-imidazol-4-yl}-pyridine		455.21
Example 56	1-[4-(4-Benzo[1,3]dioxol-5-yl-5-pyridin-2-yl-1H-imidazol-2-yl)-piperidine-1-sulfonylmethyl]-7,7-dimethyl-bicyclo[2.2.1]heptan-2-one		563.17
Example 57	2-{5-Benzo[1,3]dioxol-5-yl-2-[1-(4-chloro-phenylmethanesulfonyl)-piperidin-4-yl]-3H-imidazol-4-yl}-pyridine	^{1}H NMR (400 MHz, Methanol-d_4): δ 8.68 (m, 1H), 7.83 (m, 1H), 7.44 (m, 6H), 7.04 (m, 3H), 6.08 (s, 2H), 4.39 (s, 2H), 3.84 (m, 2H), 3.21 (m, 1H), 2.89 (m, 2H), 2.13 (m, 2H), 1.93 (m, 2H).	537.11

Example 58	2-{5-Benzo[1,3]dioxol-5-yl-2-[1-(3,5-dichloro-phenylmethanesulfonyl)-piperidin-4-yl]-3H-imidazol-4-yl}-pyridine	^{1}H NMR (400 MHz, Methanol-d_4): δ 8.68 (m, 1H), 7.84 (m, 1H), 7.46 (m, 5H), 7.04 (m, 3H), 6.08 (s, 2H), 4.41 (s, 2H), 3.89 (m, 2H), 3.26 (m, 1H), 2.95 (m, 2H), 2.17 (m, 2H), 1.96 (m, 2H).	571.04
Example 59	2-{5-Benzo[1,3]dioxol-5-yl-2-[1-(4-fluoro-phenylmethanesulfonyl)-piperidin-4-yl]-3H-imidazol-4-yl}-pyridine	^{1}H NMR (400 MHz, Methanol-d_4): δ 8.68 (m, 1H), 7.83 (t, 1H), 7.47 (m, 4H), 7.14 (m, 2H), 7.03 (m, 3H), 6.08 (s, 2H), 4.38 (s, 2H), 3.85 (m, 2H), 3.21 (m, 1H), 2.89 (m, 2H), 2.14 (m, 2H), 1.92 (m, 2H).	521.10
Example 60	2-{5-Benzo[1,3]dioxol-5-yl-2-[1-(3,4-dichloro-phenylmethanesulfonyl)-piperidin-4-yl]-3H-imidazol-4-yl}-pyridine	^{1}H NMR (400 MHz, Methanol-d_4): δ 8.68 (m, 1H), 7.84 (m, 1H), 7.65 (d, 1H), 7.57 (d, 1H), 7.44 (m, 3H), 7.03 (m, 3H), 6.08 (s, 2H), 4.40 (s, 2H), 3.87 (m, 2H), 3.22 (m, 1H), 2.93 (m, 2H), 2.15 (m, 2H), 1.95 (m, 2H).	570.99
Example 61	2-{5-Benzo[1,3]dioxol-5-yl-2-[1-(2-phenyl-ethanesulfonyl)-piperidin-4-yl]-3H-imidazol-4-yl}-pyridine	^{1}H NMR (400 MHz, MDSO-d_6): δ 8.70 (m, 1H), 7.88 (m, 1H), 7.40 (m, 6H), 7.13 (m, 4H), 6.13 (s, 2H), 3.78 (m, 2H), 3.39 (m, 2H), 3.19 (m, 1H), 3.00 (m, 4H), 2.09 (m, 2H), 1.94 (m, 2H).	517.17
Example 62	2-[5-Benzo[1,3]dioxol-5-yl-2-(1-p-tolylmethanesulfonyl-piperidin-4-yl)-3H-imidazol-4-yl]-pyridine	^{1}H NMR (400 MHz, Methanol-d_4): δ 8.57 (m, 1H), 7.84 (m, 1H), 7.55 (d, 1H), 7.44 (m, 1H), 7.23 (d, 2H), 7.16 (d, 2H), 7.01 (dd, 1H), 6.95 (d, 1H), 6.88 (d, 1H), 6.02 (s, 2H), 4.13 (s, 2H), 3.74 (m, 2H), 3.30 (m, 1H), 2.73 (m, 2H), 2.08 (m, 2H), 1.85 (m, 2H).	517.16
Example 63	3-(4-Benzo[1,3]dioxol-5-yl-1-hydroxy-5-pyridin-2-yl-1H-imidazol-2-yl)-piperidine-1-carboxylic acid benzyl ester	^{1}H NMR (400 MHz, Methanol-d_4): δ 8.72 (m, 1H), 8.01 (m, 1H), 7.59 (m, 2H), 7.36 (m, 5H), 6.99 (m, 3H), 6.06 (s, 2H), 5.16 (s, 2H), 4.52 (m, 1H), 4.23 (m, 1H), 3.44 (m, 1H), 3.24 (m, 1H), 2.99 (m, 1H), 2.26 (m, 1H), 2.03 (m, 1H), 1.90 (m, 1H), 1.67 (m, 1H).	499.3
Example 64	3-(4-Benzo[1,3]dioxol-5-yl-5-pyridin-2-yl-1H-imidazol-2-yl)-piperidine-1-carboxylic acid benzyl ester	^{1}H NMR (400 MHz, Methanol-d_4): δ 8.67 (m, 1H), 7.87 (m, 1H), 7.48 (m, 2H), 7.34 (m, 5H), 7.03 (m, 3H), 6.08 (s, 2H), 5.16 (s, 2H), 4.44 (m, 1H), 4.17 (m, 1H), 3.22 (m, 2H), 3.06 (m, 1H), 2.26 (m, 1H), 1.95 (m, 2H), 1.66 (m, 1H).	483.4

Example 65	4-[4-Benzo[1,3]dioxol-5-yl-1-hydroxy-5-(6-methyl-pyridin-2-yl)-1H-imidazol-2-yl]-piperidine-1-carboxylic acid benzyl ester	^{1}H NMR (400 MHz, Methanol-d_4): δ 7.93 (t, 1H), 7.50 (d, 1H), 7.36 (m, 6H), 7.03 (m, 2H), 6.98 (d, 1H), 6.07 (s, 2H), 5.16 (s, 2H), 4.36 (m, 2H), 3.55 (m, 1H), 3.04 (m, 2H), 2.66 (s, 3H), 2.12 (m, 2H), 1.89 (m, 2H).	513.2
Example 66	2-{5-Benzo[1,3]dioxol-5-yl-2-[1-(pyridin-2-yl-methanesulfonyl)-piperidin-4-yl]-3H-imidazol-4-yl}-pyridine	^{1}H NMR (400 MHz, Methanol-d_4): δ 8.70 (m, 1H), 8.62 (m, 1H), 7.98 (m, 1H), 7.84 (m, 1H), 7.69 (d, 1H), 7.51 (m, 1H), 7.46 (m, 2H), 7.04 (m, 3H), 6.08 (s, 2H), 4.60 (s, 2H), 3.84 (m, 2H), 3.22 (m, 1H), 2.96 (m, 2H), 2.15 (m, 2H), 1.96 (m, 2H).	504.11
Example 67	2-{5-Benzo[1,3]dioxol-5-yl-2-[1-(2-naphthalen-1-yl-ethanesulfonyl)-piperidin-4-yl]-3H-imidazol-4-yl}-pyridine	^{1}H NMR (400 MHz, $CDCl_3$): δ 8.62 (m, 1H), 8.00 (d, 1H), 7.90 (d, 1H), 7.79 (m, 2H), 7.56 (m, 3H), 7.40 (m, 3H), 7.06 (d, 1H), 7.00 (m, 1H), 6.90 (d, 1H), 6.02 (s, 2H), 3.99 (m, 2H), 3.57 (m, 2H), 3.50 (m, 1H), 3.32 (m, 2H), 2.97 (m, 2H), 2.23 (m, 2H), 1.96 (m, 2H).	567.17
Example 68	2-[5-Benzo[1,3]dioxol-5-yl-2-(1-phenylmethanesulfonyl-piperidin-3-yl)-3H-imidazol-4-yl]-pyridine	^{1}H NMR (400 MHz, Methanol-d_4): δ 8.68 (m, 1H), 7.90 (m, 1H), 7.44 (m, 7H), 7.04 (m, 3H), 6.08 (s, 2H), 4.40 (s, 2H), 3.98 (m, 1H), 3.62 (m, 1H), 3.26 (m, 1H), 3.16 (m, 1H), 2.82 (m, 1H), 2.21 (m, 1H), 1.87 (m, 2H), 1.65 (m, 1H).	503.15
Example 69	3-[4-Benzo[1,3]dioxol-5-yl-1-hydroxy-5-(6-methyl-pyridin-2-yl)-1H-imidazol-2-yl]-piperidine-1-carboxylic acid benzyl ester	^{1}H NMR (400 MHz, Methanol-d_4): δ 7.59 (t, 1H), 7.52 (d, 1H), 7.37 (m, 6H), 7.01 (m, 3H), 6.07 (s, 2H), 5.16 (s, 2H), 4.50 (m, 1H), 4.21 (m, 1H), 3.41 (m, 1H), 3.27 (m, 1H), 3.00 (m, 1H), 2.68 (s, 3H), 2.25 (m, 1H), 2.01 (m, 1H), 1.90(m, 1H), 1.67 (m, 1H).	513.2
Example 70	2-{5-Benzo[1,3]dioxol-5-yl-2-[1-(pyridin-4-yl-methanesulfonyl)-piperidin-4-yl]-3H-imidazol-4-yl}-pyridine	^{1}H NMR (400 MHz, Methanol-d_4): δ 8.77 (d, 2H), 8.69 (m, 1H), 7.90 (m, 2H), 7.86 (m, 1H), 7.46 (m, 2H), 7.06 (m, 2H), 7.01 (d, 1H), 6.09 (s, 2H), 4.64 (s, 2H), 3.96 (m, 2H), 3.27 (m, 1H), 3.05 (m, 2H), 2.19 (m, 2H), 2.00 (m, 2H).	504.11

Example 71	2-{5-Benzo[1,3]dioxol-5-yl-2-[1-(pyridin-3-yl-methanesulfonyl)-piperidin-4-yl]-3H-imidazol-4-yl}-pyridine	^{1}H NMR (400 MHz, Methanol-d_4): δ 8.79 (d, 1H), 8.73 (dd, 1H), 8.68 (m, 1H), 8.31 (m, 1H), 7.85 (m, 1H), 7.79 (dd, 1H), 7.46 (m, 2H), 7.04 (m, 3H), 6.09 (s, 2H), 4.58 (s, 2H), 3.93 (m, 2H), 3.27 (m, 1H), 3.03 (m, 2H), 2.19 (m, 2H), 1.99 (m, 2H).	504.12
Example 72	2-{5-Benzo[1,3]dioxol-5-yl-2-[1-(3-trifluoromethyl-phenylmethanesulfonyl)-piperidin-4-yl]-3H-imidazol-4-yl}-pyridine	^{1}H NMR (400 MHz, Methanol-d_4): δ 8.68 (m, 1H), 7.70 (m, 4H), 7.62 (t, 1H), 7.45 (m, 2H), 7.03 (m, 3H), 6.08 (s, 2H), 4.50 (s, 2H), 3.89 (m, 2H), 3.22 (m, 1H), 2.92 (m, 2H), 2.14 (m, 2H), 1.95 (m, 2H).	571.07
Example 73	3-[4-Benzo[1,3]dioxol-5-yl-1-hydroxy-5-(6-methyl-pyridin-2-yl)-1H-imidazol-2-yl]-pyrrolidine-1-carboxylic acid benzyl ester	^{1}H NMR (400 MHz, Methanol-d_4): δ 7.97 (t, 1H), 7.52 (d, 1H), 7.37 (m, 6H), 7.03 (m, 2H), 6.98 (t, 1H), 6.06 (s, 2H), 5.16 (s, 2H), 4.03 (m, 2H), 3.74 (m, 2H), 3.58 (m, 1H), 2.66 (s, 3H), 2.45 (m, 2H).	499.14
Example 74	2-{5-Benzo[1,3]dioxol-5-yl-2-[1-(4-trifluoromethyl-phenylmethanesulfonyl)-piperidin-4-yl]-3H-imidazol-4-yl}-pyridine		571.13
Example 75	2-{5-Benzo[1,3]dioxol-5-yl-2-[1-(3,5-bis-trifluoromethyl-phenylmethanesulfonyl)-piperidin-4-yl]-3H-imidazol-4-yl}-pyridine		639.01
Example 76	2-{5-Benzo[1,3]dioxol-5-yl-2-[1-(biphenyl-4-sulfonyl)-piperidin-4-yl]-3H-imidazol-4-yl}-pyridine	^{1}H NMR (400 MHz, Methanol-d_4): δ 8.67 (d, 1H), 7.86 (m, 5H), 7.68 (m, 2H), 7.46 (m, 5H), 7.03 (m, 3H), 6.08 (s, 2H), 3.98 (m, 2H), 3.06 (m, 1H), 2.50 (m, 2H), 2.21 (m, 2H), 2.06 (m, 2H).	565.13
Example 77	2-{5-Benzo[1,3]dioxol-5-yl-2-[1-(3,5-difluoro-phenylmethanesulfonyl)-piperidin-4-yl]-3H-imidazol-4-yl}-pyridine	^{1}H NMR (400 MHz, Methanol-d_4): δ 8.68 (m, 1H), 7.84 (m, 1H), 7.46 (m, 1H), 7.29 (m, 1H), 7.06 (m, 6H), 6.08 (s, 2H), 4.43 (s, 2H), 3.89 (m, 2H), 3.24 (m, 1H), 2.95 (m, 2H), 2.16 (m, 2H), 1.96 (m, 2H).	539.10

Example 78	2-{5-Benzo[1,3]dioxol-5-yl-2-[1-(pyridin-2-yl-methanesulfonyl)-piperidin-4-yl]-3H-imidazol-4-yl}-6-methyl-pyridine	^{1}H NMR (400 MHz, Methanol-d_4): δ 8.64 (d, 1H), 8.00 (m, 1H), 7.72 (m, 2H), 7.54 (m, 1H), 7.33 (d, 1H), 7.27 (d, 1H), 7.02 (m, 3H), 6.07 (s, 2H), 4.60 (s, 2H), 3.84 (m, 2H), 3.23 (m, 1H), 2.96 (m, 2H), 2.65 (s, 3H), 2.15 (m, 2H), 1.96 (m, 2H).	518.16
Example 79	2-{5-Benzo[1,3]dioxol-5-yl-2-[1-(4-phenoxy-benzenesulfonyl)-piperidin-4-yl]-3H-imidazol-4-yl}-pyridine	^{1}H NMR (400 MHz, Methanol-d_4): δ 8.67 (m, 1H), 7.81 (m, 3H), 7.46 (m, 4H), 7.27 (t, 1H), 7.13 (m, 4H), 7.03 (m, 3H), 6.07 (s, 2H), 4.60 (s, 2H), 3.84 (m, 2H), 3.23 (m, 1H), 2.96 (m, 2H), 2.15 (m, 2H), 1.96 (m, 2H).	581.13
Example 80	2-{5-Benzo[1,3]dioxol-5-yl-2-[1-(biphenyl-4-ylmethanesulfonyl)-piperidin-4-yl]-3H-imidazol-4-yl}-pyridine	^{1}H NMR (400 MHz, Methanol-d_4): δ 8.67 (m, 1H), 7.82 (m, 1H), 7.66 (m, 4H), 7.56 (d, 2H), 7.44 (m, 4H), 7.35 (t, 1H), 7.02 (m, 3H), 6.08 (s, 2H), 4.44 (s, 2H), 3.87 (m, 2H), 3.21 (m, 1H), 2.91 (m, 2H), 2.11 (m, 2H), 1.92 (m, 2H).	579.12
Example 81	4-[5-Benzo[1,3]dioxol-5-yl-1-methyl-4-(6-methyl-pyridin-2-yl)-1H-imidazol-2-yl]-piperidine-1-carboxylic acid benzyl ester	^{1}H NMR (400 MHz, Methanol-d_4): δ 7.77 (t, 1H), 7.37 (m, 7H), 7.22 (d, 1H), 6.83 (m, 2H), 6.00 (s, 2H), 5.16 (s, 2H), 4.37 (m, 2H), 3.84 (s, 3H), 3.56 (m, 1H), 3.09 (m, 2H), 2.66 (s, 3H), 2.10 (m, 2H), 1.88 (m, 2H).	511.4
Example 82	4-[4-Benzo[1,3]dioxol-5-yl-1-methyl-5-(6-methyl-pyridin-2-yl)-1H-imidazol-2-yl]-piperidine-1-carboxylic acid benzyl ester	^{1}H NMR (400 MHz, Methanol-d_4): δ 7.79 (t, 1H), 7.36 (m, 6H), 7.07 (m, 2H), 6.95 (m, 2H), 6.11 (s, 2H), 5.17 (s, 2H), 4.37 (m, 2H), 3.60 (s, 3H), 3.40 (m, 1H),3.07 (m, 2H), 2.69 (s, 3H), 2.00 (m, 4H).	511.4
Example 83	{4-[4-Benzo[1,3]dioxol-5-yl-1-hydroxy-5-(6-methyl-pyridin-2-yl)-1H-imidazol-2-yl]-cyclohexyl}-carbamic acid benzyl ester	^{1}H NMR (400 MHz, Methanol-d_4): δ 7.90 (t, 1H), 7.48 (d, 1H), 7.35 (m, 6H), 7.01 (m, 3H), 6.07 (s, 2H), 5.09 (s, 2H), 3.52 (m, 1H), 2.66 (s, 3H), 2.16 (m, 3H), 1.99 (m, 2H), 1.82 (m, 2H), 1.46 (m, 2H).	527.2
Example 84	2-{5-Benzo[1,3]dioxol-5-yl-2-[1-(3-phenoxy-phenylmethanesulfonyl)-piperidin-4-yl]-3H-imidazol-4-yl}-6-methyl-pyridine	(400 MHz, Methanol-d_4) δ 7.74 (t, 1H, J = 7.8 Hz), 7.20 (m, 14H), 6.07 (s, 2H), 4.38 (s, 2H), 3.85 (m, 2H), 3.22 (m, 1H), 2.87 (m, 2H), 2.66 (s, 3H), 2.12 (m, 2H), 1.94 (m, 2H).	609.3

Example 85	2-[5-Benzo[1,3]dioxol-5-yl-2-(1-ethanesulfonyl-piperidin-4-yl)-3H-imidazol-4-yl]-6-methyl-pyridine	(400 MHz, Methanol-d_4) δ 7.74 (t, 1H, J = 7.9 Hz), 7.34 (m, 1H), 7.28 (m, 1H), 7.03 (m, 3H), 6.08 (s, 2H), 3.92 (m, 2H), 3.25 (m, 1H), 2.94 (m, 4H), 2.66 (s, 3H), 2.23 (m, 2H), 2.03 (m, 2H), 1.35 (t, 3H, J = 7.3 Hz).	455.2
Example 86	2-{5-Benzo[1,3]dioxol-5-yl-2-[1-(propane-1-sulfonyl)-piperidin-4-yl]-3H-imidazol-4-yl}-6-methyl-pyridine	(400 MHz, Methanol-d_4) δ 7.74 (t, 1H, J = 7.9 Hz), 7.34 (m, 1H), 7.28 (m, 1H), 7.03 (m, 3H), 6.08 (s, 2H), 3.92 (m, 2H), 3.25 (m, 1H), 2.94 (m, 4H), 2.66 (s, 3H), 2.23 (m, 2H), 2.03 (m, 2H), 1.84 (m, 2H), 1.09 (t, 3H, J = 7.3 Hz).	469.2
Example 87	2-{5-Benzo[1,3]dioxol-5-yl-2-[1-(butane-1-sulfonyl)-piperidin-4-yl]-3H-imidazol-4-yl}-6-methyl-pyridine	(400 MHz, Methanol-d_4) δ 7.74 (t, 1H, J = 7.9 Hz), 7.34 (m, 1H), 7.28 (m, 1H), 7.03 (m, 3H), 6.08 (s, 2H), 3.92 (m, 2H), 3.25 (m, 1H), 2.94 (m, 4H), 2.66 (s, 3H), 2.23 (m, 2H), 2.03 (m, 2H), 1.78 (m, 2H), 1.50 (m, 2H), 0.99 (t, 3H, J = 7.3 Hz).	483.2
Example 88	2-{5-Benzo[1,3]dioxol-5-yl-2-[1-(pyridin-3-ylmethanesulfonyl)-piperidin-4-yl]-3H-imidazol-4-yl}-6-methyl-pyridine	(400 MHz, Methanol-d_4) δ 8.75 (m, 2H), 8.28 (m, 1H), 7.75 (m, 2H), 7.32 (m, 2H), 7.02 (m, 3H), 6.07 (s, 2H), 4.54 (s, 2H), 3.91 (m, 2H), 3.26 (m, 1H), 3.03 (m, 2H), 2.66 (s, 3H), 2.18 (m, 2H), 1.99 (m, 2H).	518.1
Example 89	2-{5-Benzo[1,3]dioxol-5-yl-2-[1-(pyridin-4-ylmethanesulfonyl)-piperidin-4-yl]-3H-imidazol-4-yl}-6-methyl-pyridine	(400 MHz, Methanol-d_4) δ 8.78 (m, 2H), 7.94 (m, 2H), 7.75 (t, 1H, J = 7.8 Hz), 7.32 (m, 2H), 7.02 (m, 3H), 6.07 (s, 2H), 4.54 (s, 2H), 3.91 (m, 2H), 3.26 (m, 1H), 3.03 (m, 2H), 2.66 (s, 3H), 2.18 (m, 2H), 1.99 (m, 2H).	518.1
Example 90	2-{5-Benzo[1,3]dioxol-5-yl-2-[1-(3,5-difluoro-phenylmethanesulfonyl)-piperidin-4-yl]-3H-imidazol-4-yl}-6-methyl-pyridine	(400 MHz, Methanol-d_4) δ 7.75 (m, 3H), 7.62 (t, 1H, J = 7.8 Hz), 7.34 (d, 1H, J = 7.8 Hz), 7.28 (d, 1H, J = 7.8 Hz), 7.02 (m, 3H), 6.07 (s, 2H), 4.50 (s, 2H), 3.91 (m, 2H), 3.26 (m, 1H), 3.03 (m, 2H), 2.66 (s, 3H), 2.18 (m, 2H), 1.99 (m, 2H).	553.1

Example 91	2-{5-Benzo[1,3]dioxol-5-yl-2-[1-(3-trifluoromethyl-phenylmethanesulfonyl)-piperidin-4-yl]-3H-imidazol-4-yl}-6-methyl-pyridine	(400 MHz, Methanol-d_4) δ 7.74 (t, 1H, J = 7.8 Hz), 7.34 (d, 1H, J = 7.8 Hz), 7.28 (d, 1H, J = 7.8 Hz), 7.12 (m, 2H), 7.02 (m, 4H), 6.07 (s, 2H), 4.43 (s, 2H), 3.91 (m, 2H), 3.26 (m, 1H), 3.03 (m, 2H), 2.66 (s, 3H), 2.18 (m, 2H), 1.99 (m, 2H).	585.2
Example 92	2-{5-Benzo[1,3]dioxol-5-yl-2-[1-(thiophene-2-sulfonyl)-piperidin-4-yl]-3H-imidazol-4-yl}-6-methyl-pyridine	(400 MHz, Methanol-d_4) δ 7.90 (m, 1H), 7.74 (t, 1H, J = 7.8 Hz), 7.65 (m, 1H), 7.34 (m,1H), 7.27 (m, 2H), 7.02 (m, 3H), 6.07 (s, 2H), 3.91 (m, 2H), 3.26 (m, 1H), 3.03 (m, 2H), 2.66 (s, 3H), 2.18 (m, 2H), 1.99 (m, 2H).	509.2
Example 93	2-{5-Benzo[1,3]dioxol-5-yl-2-[1-(butane-1-sulfonyl)-piperidin-3-yl]-3H-imidazol-4-yl}-6-methyl-pyridine	(400 MHz, Methanol-d_4) δ7.80 (t, 1H, J = 7.8 Hz), 7.36 (m, 2H), 7.03 (m, 3H), 6.07 (s, 2H), 3.95 (m, 1H), 3.60 (m, 1H), 3.26 (m, 1H), 3.17 (m, 1H), 3.08 (m, 2H), 2.84 (m, 1H), 2.66 (s, 3H), 2.20 (m, 1H), 1.86 (m, 2H), 1.76 (m, 2H), 1.64 (m, 1H), 1.48 (m, 2H), 0.97 (t, 3H, J = 7.3 Hz).	483.3
Example 94	2-[5-Benzo[1,3]dioxol-5-yl-2-(1-phenylmethanesulfonyl-piperidin-3-yl)-3H-imidazol-4-yl]-6-methyl-pyridine	(400 MHz, Methanol-d_4) δ 7.82 (t, 1H, J = 7.8 Hz), 7.39 (m, 7H), 7.02 (m, 3H), 6.07 (s, 2H), 4.40 (s, 2H), 3.95 (m, 1H), 3.60 (m, 1H), 3.26 (m, 1H), 3.17 (m, 1H), 2.84 (m, 1H), 2.66 (s, 3H), 2.20 (m, 1H), 1.86 (m, 2H), 1.64 (m, 1H).	517.30
Example 95	2-{5-Benzo[1,3]dioxol-5-yl-2-[1-(1-methyl-1H-imidazole-4-sulfonyl)-piperidin-4-yl]-3H-imidazol-4-yl}-6-methyl-pyridine	(400 MHz, Methanol-d_4) δ 7.82 (m, 1H), 7.77 (m, 1H), 7.73 (t, 1H, J = 7.8 Hz), 7.33 (d, 1H, J = 7.8 Hz), 7.26 (d,1H, J = 7.8 Hz), 7.02 (m, 3H), 6.07 (s, 2H), 3.91 (m, 2H), 3.82 (s, 3H), 3.26 (m, 1H), 3.03 (m, 2H), 2.66 (s, 3H), 2.18 (m, 2H), 1.99 (m, 2H).	507.09
Example 96	2-{5-Benzo[1,3]dioxol-5-yl-2-[1-(5-methyl-isoxazole-4-sulfonyl)-piperidin-4-yl]-3H-imidazol-4-yl}-6-methyl-pyridine	(400 MHz, Methanol-d_4) δ 8.67 (s, 1H), 7.73 (t, 1H, J = 7.8 Hz), 7.33 (d, 1H, J = 7.8 Hz), 7.26 (d,1H, J = 7.8 Hz), 7.02 (m, 3H), 6.07 (s, 2H), 3.91 (m, 2H), 3.82 (s, 3H), 3.26 (m, 1H), 3.03 (m, 2H), 2.71 (s, 3H), 2.66 (s, 3H), 2.18 (m, 2H), 1.99 (m, 2H).	508.05

Example 97	4-[5-Benzo[1,3]dioxol-5-yl-1-hydroxy-4-(6-methyl-pyridin-2-yl)-1H-imidazol-2-yl]-piperidine-1-carboxylic acid benzyl ester	^{1}H NMR (400 MHz, Methanol-d_4): δ 8.00 (t, 1H), 7.48 (d, 1H), 7.36 (m, 7H), 7.00 (m, 2H), 6.07 (s, 2H), 5.16 (s, 2H), 4.31 (m, 2H), 3.35 (m, 1H), 3.07 (m, 2H), 2.76 (s, 3H), 2.05 (m, 2H), 1.94 (m, 2H).	513.3
Example 98	Butane-1-sulfonic acid {4-[4-benzo[1,3]dioxol-5-yl-5-(6-methyl-pyridin-2-yl)-1H-imidazol-2-yl]-cyclohexyl}-amide	(400 MHz, Methanol-d_4) δ 7.70 (m, 1H), 7.28 (m, 2H), 7.03 (m, 3H), 6.07 (s, 2H), 3.08 (m, 2H), 3.05 (m, 2H), 2.63 (s, 3H), 2.13 (m, 2H), 1.95 (m, 2H), 1.76 (m, 2H), 1.72 (m, 2H), 1.48 (m, 2H), 1.43 (m, 2H), 0.98 (m, 3H).	497.2
Example 99	N-{4-[4-Benzo[1,3]dioxol-5-yl-5-(6-methyl-pyridin-2-yl)-1H-imidazol-2-yl]-cyclohexyl}-C-pyridin-2-yl-methanesulfonamide	(400 MHz, Methanol-d_4) δ 8.64 (m, 1H), 8.03 (t, 1H, J = 7.8 Hz), 7.71 (m, 2H), 7.56 (m, 1H), 7.31 (d, 1H, J = 7.8 Hz), 7.24 (d, 1H, J = 7.8 Hz), 7.03 (m, 3H), 6.07 (s, 2H), 4.60 (s, 2H), 3.05 (m, 2H), 2.63 (s, 3H), 2.13 (m, 2H), 1.95 (m, 2H), 1.72 (m, 2H), 1.43 (m, 2H).	531.9
Example 100	Thiophene-2-sulfonic acid {4-[4-benzo[1,3]dioxol-5-yl-5-(6-methyl-pyridin-2-yl)-1H-imidazol-2-yl]-cyclohexyl}-amide	(400 MHz, CD_2Cl_2) δ 7.95 (t, 1H, J = 8.1 Hz), 7.62 (m, 2H), 7.47 (m, 2H), 7.10 (m, 1H), 7.02 (m, 1H), 6.95 (m, 1H), 6.89 (m, 1H), 6.07 (s, 2H), 3.05 (m, 2H), 2.63 (s, 3H), 2.13 (m, 2H), 1.95 (m, 2H), 1.72 (m, 2H), 1.43 (m, 2H).	523.2
Example 101	1-Methyl-1H-imidazole-4-sulfonic acid {4-[4-benzo[1,3]dioxol-5-yl-5-(6-methyl-pyridin-2-yl)-1H-imidazol-2-yl]-cyclohexyl}-amide	(400 MHz, Methanol-d_4) δ 7.80 (m, 1H), 7.68 (m, 2H), 7.29 (m, 1H), 7.22 (m, 1H), 7.02 (m, 3H), 6.07 (s, 2H), 3.80 (s, 3H), 3.05 (m, 2H), 2.63 (s, 3H), 2.13 (m, 2H), 1.95 (m, 2H), 1.72 (m, 2H), 1.43 (m, 2H).	521.1

Example 102	4-[4-Benzo[1,3]dioxol-5-yl-1-hydroxy-5-(6-methyl-pyridin-2-yl)-1H-imidazol-2-yl]-bicyclo[2.2.2]octane-1-carboxylic acid amide	^{1}H NMR (400 MHz, Methanol-d_4): δ 7.88 (t, 1H), 7.48 (d, 1H), 7.29 (d, 1H), 7.02 (m, 3H), 6.08 (s, 2H), 2.66 (s, 3H), 2.27 (m, 6H), 1.97 (m, 6H).	447.14
Example 103	4-[4-Benzo[1,3]dioxol-5-yl-1-hydroxy-5-(6-methyl-pyridin-2-yl)-1H-imidazol-2-yl]-bicyclo[2.2.2]octane-1-carboxylic acid methyl ester	^{1}H NMR (400 MHz, Methanol-d_4): δ 7.87 (t, 1H), 7.46 (d, 1H), 7.30 (d, 1H), 7.04 (m, 3H), 3.68 (s, 3H), 6.08 (s, 2H), 2.66 (s, 3H), 2.24 (m, 6H), 1.99 (m, 6H).	462.3
Example 104	4-[4-Benzo[1,3]dioxol-5-yl-5-(6-bromo-pyridin-2-yl)-1H-imidazol-2-yl]-piperidine-1-carboxylic acid benzyl ester	(400 MHz, $CDCl_3$) δ 7.43 (d, 1H), 7.37-7.28 (m, 6H), 7.26-7.23 (m, 1H), 7.05 (dd, 1H), 7.04 (s, 1H), 6.83 (dd, 1H), 5.98 (s, 2H), 5.12 (s, 2H), 3.07 (br, 1H), 2.93 (br, 2H), 2.08 (d(br), 2H), 1.83 (q(br), 2H)	591.0/ 593.0
Example 105	2-{5-Benzo[1,3]dioxol-5-yl-2-[1-(thiophene-3-sulfonyl)-piperidin-4-yl]-3H-imidazol-4-yl}-6-methyl-pyridine	(400 MHz, Methanol-d_4) δ 8.15 (m, 1H), 7.72 (m, 2H), 7.38 (d, 1H, J = 5.1 Hz), 7.33 (d, 1H, J = 7.8 Hz), 7.28 (d, 1H, J = 7.8 Hz), 7.01 (m, 3H), 6.07 (s, 2H), 3.91 (m, 2H), 3.26 (m, 1H), 3.03 (m, 2H), 2.66 (s, 3H), 2.18 (m, 2H), 1.99 (m, 2H)	509.0
Example 106	2-{5-Benzo[1,3]dioxol-5-yl-2-[1-(5-methyl-2-trifluoromethyl-furan-3-sulfonyl)-piperidin-4-yl]-3H-imidazol-4-yl}-6-methyl-pyridine	(400 MHz, Methanol-d_4) δ 7.76 (m, 1H), 7.30 (m, 3H), 7.01 (m, 3H), 6.07 (s, 2H), 3.91 (m, 2H), 3.26 (m, 1H), 3.03 (m, 2H), 2.66 (s, 3H), 2.64 (s, 3H), 2.18 (m, 2H), 1.99 (m, 2H)	575.2

Example 107	4-[2-(1-phenylmethanesulfonyl-piperidin-4-yl)-5-(6-methyl-pyridin-2-yl)-1H-imidazol-4-yl]-pyridin-2-yl-fluoride	(400MHz, $CDCl_3$), d 8.29 (dd, 1H), 7.96-7.89 (m, 1H), 7.50 (t, 1H), 7.40-7.37 (m, 6H), 7.09 (d, 1H), 7.02 (d, 1H), 4.23 (s, 2H), 3.99 (s, 1H), 3.74 (d, 2H), 2.86 (d, 3H), 2.77 (t, 2H), 2.07 (m, 2H), 1.94 (m, 2H)	492.4
Example 108	4-[4-Benzo[1,3]dioxol-5-yl-5-(6-trifluoromethyl-pyridin-2-yl)-1H-imidazol-2-yl]-piperidine-1-carboxylic acid benzyl ester	(400 MHz, $CDCl_3$) δ 7.79 (t, 1H), 7.67 (d, 1H), 7.58 (d, 1H), 7.31-7.21 (m, 5H), 7.05 (d, 1H), 7.00 (s, 1H), 6.83 (d, 1H), 5.98 (s, 2H), 5.04 (d(br), 2H), 4.29 (br, 2H), 3.58 (br, 1H), 2.92 (br, 2H), 2.10-1.80 (br, 4H)	551.2
Example 109	4-[5-Benzo[1,3]dioxol-5-yl-4-(6-bromo-pyridin-2-yl)-1-hydroxy-1H-imidazol-2-yl]-piperidine-1-carboxylic acid benzyl ester	(400 MHz, MeOH- d_4) δ 7.63-7.56 (m, 2H), 7.39-7.32 (m, 5H), 7.26 (d, 1H), 7.02 (br, 3H), 6.09 (s, 2H), 5.17 (s, 2H), 4.36 (d(br), 2H), 3.56 (br, 1H), 3.06 (br, 2H), 2.07-1.99 (br, 4H)	577.0/ 579.0
Example 110	2-[5-Benzo[1,3]dioxol-5-yl-2-(1-phenylmethanesulfonyl-piperidin-4-yl)-3H-imidazol-4-yl]-6-bromo-pyridine	(400 MHz, $CDCl_3$) δ 7.46-7.35 (m, 6H), 7.25 (d, 1H), 7.07 (d, 1H), 7.05 (dd, 1H), 6.84 (d, 1H), 5.99 (s, 2H), 4.23 (s, 2H), 3.71 (d(br), 2H), 2.85 (br, 1H), 2.72 (t(br), 2H), 1.96 (d(br), 2H), 1.72 (m, 2H)	580.8/ 582.8
Example 111	{4-[4-Benzo[1,3]dioxol-5-yl-5-(6-methyl-pyridin-2-yl)-1H-imidazol-2-yl]-bicyclo[2.2.2]oct-1-yl}-methanol	(300 MHz, Methanol-d_4) δ 7.71 (t, 1H, J = 7.8 Hz), 7.33 (d, 1H, J = 7.8 Hz), 7.21 (d, 1H, J = 7.8 Hz), 6.97 (m, 3H), 6.07 (s, 2H), 3.28 (s, 2H), 2.64 (s, 3H), 2.11 (m, 6H), 1.66 (m, 6H).	418.4
Example 112	4-[4-Benzo[1,3]dioxol-5-yl-5-(6-methyl-pyridin-2-yl)-1H-imidazol-2-yl]-bicyclo[2.2.2]octane-1-carboxylic acid amide	(300 MHz, Methanol-d_4) δ 7.70 (t, 1H, J = 7.8 Hz), 7.31 (d, 1H, J = 7.8 Hz), 7.20 (d, 1H, J = 7.8 Hz), 6.97 (m, 3H), 6.06 (s, 2H), 2.64 (s, 3H), 2.11 (m, 6H), 1.66 (m, 6H).	431.4
Example 113	4-[4-Benzo[1,3]dioxol-5-yl-5-(6-methyl-pyridin-2-yl)-2H-imidazol-2-yl]-piperidine-1-sulfonic acid dimethylamide	(300 MHz, Methanol-d_4) δ 7.74 (t, 1H, J = 7.9 Hz), 7.34 (m, 1H), 7.28 (m, 1H), 7.03 (m, 3H), 6.07 (s, 2H), 3.92 (m, 2H), 3.25 (m, 1H), 2.94 (m, 2H), 2.85 (s, 6H), 2.66 (s, 3H), 2.23 (m, 2H), 2.03 (m, 2H).	470.2
Example 114	1-{4-[4-Benzo[1,3]dioxol-5-yl-5-(6-methyl-pyridin-2-yl)-1H-imidazol-2-yl]-piperidin-1-yl}-3-phenyl-propan-1-one	(300 MHz, Methanol-d_4) δ 7.74 (t, 1H, J = 7.8 Hz), 7.27 (m, 7H), 7.03 (m, 3H), 6.08 (s, 2H), 4.10 (m, 2H), 3.89 (m, 2H), 3.42 (m, 1H), 3.11 (m, 2H), 2.92 (m, 2H), 2.66 (s, 3H), 1.94 (m, 4H).	495.3

Example 115	2-{5-Benzo[1,3]dioxol-5-yl-2-[1-(propane-2-sulfonyl)-piperidin-4-yl]-3H-imidazol-4-yl}-6-methyl-pyridine	(300 MHz, Methanol-d_4) δ 7.74 (t, 1H, J = 7.9 Hz), 7.34 (m, 1H), 7.28 (m, 1H), 7.03 (m, 3H), 6.07 (s, 2H), 3.92 (m, 2H), 3.25 (m, 2H), 2.94 (m, 2H), 2.66 (s, 3H), 2.23 (m, 2H), 2.03 (m, 2H), 1.25 (d, 6H, J = 9.0 Hz).	470.2
Example 116	4-[4-Benzo[1,3]dioxol-5-yl-5-(6-methyl-pyridin-2-yl)-1H-imidazol-2-yl]-bicyclo[2.2.2]octane-1-carbonitrile	(300 MHz, Methanol-d_4) δ 7.80 (t, 1H, J = 7.8 Hz), 7.38 (d, 1H, J = 7.8 Hz), 7.28 (d, 1H, J = 7.8 Hz), 6.97 (m, 3H), 6.06 (s, 2H), 2.64 (s, 3H), 2.14 (m, 12H).	413.3
Example 117	4-[4-Benzo[1,3]dioxol-5-yl-5-(6-methyl-pyridin-2-yl)-1H-imidazol-2-yl]-bicyclo[2.2.2]oct-1-ylamine	(300 MHz, Methanol-d_4) δ 7.07 (m, 6H), 6.05 (s, 2H), 2.66 (s, 3H), 2.24 (m, 6H), 1.98 (m, 6H).	403.4
Example 118	N-{4-[4-Benzo[1,3]dioxol-5-yl-5-(6-methyl-pyridin-2-yl)-1H-imidazol-2-yl]-bicyclo[2.2.2]oct-1-yl}-C-phenyl-methanesulfonamide	(300 MHz, Methanol-d_4) δ 7.74 (t, 1H, J = 7.8 Hz), 7.38 (m, 6H), 7.23 (d, 1H, J = 7.8 Hz), 6.98 (m, 3H), 6.06 (s, 2H), 2.65 (s, 3H), 2.18 (m, 6H), 2.03 (m, 6H).	557.4
Example 119	N-{4-[4-Benzo[1,3]dioxol-5-yl-5-(6-methyl-pyridin-2-yl)-1H-imidazol-2-yl]-bicyclo[2.2.2]oct-1-yl}-methanesulfonamide	(300 MHz, Methanol-d_4) δ 7.74 (t, 1H, J = 7.8 Hz), 7.35 (d, 1H, J = 7.8 Hz), 7.23 (d, 1H, J = 7.8 Hz), 6.98 (m, 3H), 6.06 (s, 2H), 3.01 (s, 3H), 2.65 (s, 3H), 2.19 (m, 6H), 2.10 (m, 6H).	481.6
Example 120	N-{4-[4-Benzo[1,3]dioxol-5-yl-5-(6-methyl-pyridin-2-yl)-1H-imidazol-2-yl]-bicyclo[2.2.2]oct-1-yl}-C-pyridin-2-yl-methanesulfonamide	(300 MHz, Methanol-d_4) δ 8.66 (d, 1H, J = 4.2 Hz), 8.09 (t, 1H, J = 7.8 Hz), 7.76 (m, 2H), 7.61 (m, 1H), 7.36 (d, J = 7.8 Hz), 7.24 (d, 1H, J = 8.1 Hz), 6.98 (m, 3H), 6.06 (s, 2H), 5.49 (s, 1H), 4.60 (s, 2H), 2.66 (s, 3H), 2.19 (m, 6H), 2.12 (m, 6H).	558.4
Example 121	2-{5-Benzo[1,3]dioxol-5-yl-2-[4-(1H-tetrazol-5-yl)-bicyclo[2.2.2]oct-1-yl]-3H-imidazol-4-yl}-6-methyl-pyridine	(300 MHz, Methanol-d_4) δ 7.77 (t, 1H, J = 7.8 Hz), 7.37 (d, 1H, J = 7.8 Hz), 7.27 (d, 1H, J = 7.8 Hz), 7.00 (m, 3H), 6.06 (s, 2H), 2.66 (s, 3H), 2.26 (m, 6H), 2.19 (m, 6H).	456.4
Example 122	N-{4-[4-Benzo[1,3]dioxol-5-yl-5-(6-methyl-pyridin-2-yl)-1H-imidazol-2-yl]-bicyclo[2.2.2]oct-1-yl}-acetamide	(300 MHz, CD_2Cl_2) δ 7.87 (t, 1H, J = 8.1 Hz), 7.38 (m, 2H), 6.93 (m, 3H), 6.05 (s, 2H), 2.74 (s, 3H), 2.69 (s, 3H), 2.21 (m, 6H), 2.08 (m, 6H).	445.6

Example 123	Thiophene-2-sulfonic acid {4-[4-benzo[1,3]dioxol-5-yl-5-(6-methyl-pyridin-2-yl)-1H-imidazol-2-yl]-bicyclo[2.2.2]oct-1-yl}-amide	(300 MHz, Methanol-d_4) δ 7.75 (m, 2H), 7.61 (m, 1H), 7.33 (m, 1H), 7.20 (m, 1H), 7.11 (m, 1H), 6.95 (m, 3H), 6.05 (s, 2H), 2.64 (s, 3H), 2.12 (m, 6H), 1.98 (m, 6H).	549.5
Example 124	1-Methyl-1H-imidazole-4-sulfonic acid {4-[4-benzo[1,3]dioxol-5-yl-5-(6-methyl-pyridin-2-yl)-1H-imidazol-2-yl]-bicyclo[2.2.2]oct-1-yl}-amide	(300 MHz, Methanol-d_4) δ 7.74 (m, 3H), 7.34 (d, 1H, J = 7.8 Hz), 7.21 (d, 1H, J = 8.4 Hz), 6.05 (s, 2H), 3.79 (s, 3H), 2.66 (s, 3H), 2.56 (m, 6H), 1.98 (m, 6H).	547.5
Example 125	Thiophene-3-sulfonic acid {4-[4-benzo[1,3]dioxol-5-yl-5-(6-methyl-pyridin-2-yl)-1H-imidazol-2-yl]-bicyclo[2.2.2]oct-1-yl}-amide	(300 MHz, Methanol-d_4) δ 8.05 (m, 1H), 7.72 (m, 1H), 7.60 (m, 1H), 7.37 (m, 2H), 7.21 (m, 1H), 6.96 (m, 3H), 6.05 (s, 2H), 2.64 (s, 3H), 2.12 (m, 6H), 1.94 (m, 6H).	549.5
Example 126	2-{5-Benzo[1,3]dioxol-5-yl-2-[1-(2-phenyl-ethenesulfonyl)-piperidin-4-yl]-3H-imidazol-4-yl}-6-methyl-pyridine	(300 MHz, Methanol-d_4) δ 7.70 (m, 3H), 7.46 (m, 5H), 7.26 (m, 2H), 7.02 (m, 4H), 6.07 (s, 2H), 3.93 (m, 2H), 3.19 (m, 1H), 2.87 (m, 2H), 2.64 (s, 3H), 2.22 (m, 2H), 2.04 (m, 2H).	529.8
Example 127	2-{5-Benzo[1,3]dioxol-5-yl-2-[1-(2-phenyl-ethanesulfonyl)-piperidin-4-yl]-3H-imidazol-4-yl}-6-methyl-pyridine	(300 MHz, Methanol-d_4) δ 7.74 (m, 1H), 7.31 (m, 7H), 7.02 (m, 3H), 6.07 (s, 2H), 3.95 (m, 2H), 3.30 (m, 3H), 3.10 (m, 2H), 2.99 (m, 2H), 2.65 (s, 3H), 2.16 (m, 2H), 1.98 (m, 2H).	531.8
Example 128	Methanesulfonic acid 4-[4-benzo[1,3]dioxol-5-yl-5-(6-methyl-pyridin-2-yl)-1H-imidazol-2-yl]-bicyclo[2.2.2]oct-1-ylmethyl ester	(300 MHz, Methanol-d_4) δ 7.73 (t, 1H, J = 7.8 Hz), 7.34 (d, 1H, J = 7.8 Hz), 7.22 (d, 1H, J = 7.8 Hz), 6.98 (m, 3H), 6.06 (s, 2H), 3.98 (s, 2H), 3.08 (s, 3H), 2.65 (s, 3H), 2.12 (m, 6H), 1.73 (m, 6H).	496.5
Example 129	{4-[4-Benzo[1,3]dioxol-5-yl-5-(6-methyl-pyridin-2-yl)-1H-imidazol-2-yl]-bicyclo[2.2.2]oct-1-yl}-acetonitrile	(300 MHz, Methanol-d_4) δ 7.73 (t, 1H, J = 7.8 Hz), 7.34 (d, 1H, J = 7.8 Hz), 7.23 (d, 1H, J = 7.8 Hz), 6.98 (m, 3H), 6.06 (s, 2H), 2.65 (s, 3H), 2.40 (s, 2H), 2.14 (m, 6H), 1.77 (m, 6H).	427.4

Example 130	{4-[4-Benzo[1,3]dioxol-5-yl-5-(6-methyl-pyridin-2-yl)-1H-imidazol-2-yl]-bicyclo[2.2.2]oct-1-yl}-acetic acid	(300 MHz, Methanol-d_4) δ 7.71 (t, 1H, J = 7.5 Hz), 7.33 (d, 1H, J = 7.8 Hz), 7.20 (d, 1H, J = 8.1 Hz), 6.97 (m, 3H), 6.06 (s, 2H), 2.65 (s, 3H), 2.18 (s, 2H), 2.09 (m, 6H), 1.77 (m, 6H).	446.3
Example 131	N-{4-[4-Benzo[1,3]dioxol-5-yl-5-(6-methyl-pyridin-2-yl)-1H-imidazol-2-yl]-bicyclo[2.2.2]oct-1-ylmethyl}-methanesulfonamide	(300 MHz, Methanol-d_4) δ 8.09 (m, 1H), 7.71 (m, 1H), 7.34 (m, 1H), 7.22 (m, 1H), 6.98 (m, 2H), 6.85 (d, 1H, J = 7.5 Hz), 6.06 (s, 2H), 3.18 (s, 3H), 2.92 (s, 2H), 2.65 (s, 3H), 2.11 (m, 6H), 1.67 (m, 6H).	495.5
Example 132	2-{5-Benzo[1,3]dioxol-5-yl-2-[1-(biphenyl-4-sulfonyl)-piperidin-4-yl]-3H-imidazol-4-yl}-6-methyl-pyridine	(300 MHz, Methanol-d_4) δ 7.90 (m, 4H), 7.72 (m, 3H), 7.49 (m, 3H), 7.32 (d, 1H, J = 7.8 Hz), 7.26 (d, 1H, J = 8.1 Hz), 7.01 (m, 3H), 6.07 (s, 2H), 4.00 (m, 2H), 3.06 (m, 1H), 2.63 (s, 3H), 2.50 (m, 2H), 2.18 (m, 2H), 2.06 (m, 2H).	579.7
Example 133	2-{5-Benzo[1,3]dioxol-5-yl-2-[1-(4-phenoxy-benzenesulfonyl)-piperidin-4-yl]-3H-imidazol-4-yl}-6-methyl-pyridine	(300 MHz, Methanol-d_4) δ 7.77 (m, 3H), 7.45 (m, 2H), 7.27 (m, 3H), 7.12 (m, 4H), 7.10 (m, 3H), 6.07 (s, 2H), 3.95 (m, 2H), 3.07 (m, 1H), 2.64 (s, 3H), 2.46 (m, 2H), 2.19 (m, 2H), 2.04 (m, 2H).	595.8
Example 134	2-{5-Benzo[1,3]dioxol-5-yl-2-[1-(3,4-dichloro-benzenesulfonyl)-piperidin-4-yl]-3H-imidazol-4-yl}-6-methyl-pyridine	(300 MHz, Methanol-d_4) δ 7.79 (m, 4H), 7.31 (m, 2H), 7.01 (m, 3H), 6.07 (s, 2H), 3.98 (m, 2H), 3.09 (m, 1H), 2.65 (s, 3H), 2.53 (m, 3H), 2.53 (m, 2H), 2.21 (m, 2H), 2.05 (m, 2H).	571.2
Example 135	N-{4-[4-Benzo[1,3]dioxol-5-yl-5-(6-methyl-pyridin-2-yl)-1H-imidazol-2-yl]-bicyclo[2.2.2]oct-1-ylmethyl}-C-phenyl-methanesulfonamide	(300 MHz, Methanol-d_4) δ 7.72 (m, 1H), 7.40 (m, 6H), 7.22 (m, 1H), 6.98 (m, 3H), 6.06 (s, 2H), 4.54 (d, 2H, J = 3.3 Hz), 4.21 (m, 1H), 3.87 (s, 2H), 2.64 (s, 3H), 2.06 (m, 6H), 1.64 (m, 6H).	572.4
Example 136	N-{4-[4-Benzo[1,3]dioxol-5-yl-5-(6-methyl-pyridin-2-yl)-1H-imidazol-2-yl]-bicyclo[2.2.2]oct-1-ylmethyl}-C-pyridin-2-yl-methanesulfonamide	(300 MHz, Methanol-d_4) δ 8.60 (m, 1H), 7.92 (m, 1H), 7.70 (m, 2H), 7.49 (m, 1H), 7.34 (m, 1H), 7.23 (m, 1H), 6.98 (m, 3H), 6.06 (s, 2H), 4.72 (s, 2H), 3.68 (s, 2H), 2.65 (s, 3H), 2.08 (m, 6H), 1.67 (m, 6H).	573.4

Example 137	4-[4-Benzo[1,3]dioxol-5-yl-5-(6-methyl-pyridin-2-yl)-1H-imidazol-2-yl]-bicyclo[2.2.2]octane-1-carboxylic acid benzylamide	(300 MHz, Methanol-d_4) δ 7.73 (m, 1H), 7.29 (m, 7H), 6.98 (m, 3H), 6.06 (s, 2H), 4.39 (s, 2H), 2.65 (s, 3H), 2.12 (m, 6H), 1.99 (m, 6H).	521.6
Example 138	4-[4-Benzo[1,3]dioxol-5-yl-5-(6-methyl-pyridin-2-yl)-1H-imidazol-2-yl]-bicyclo[2.2.2]octane-1-carboxylic acid (pyridin-2-ylmethyl)-amide	(300 MHz, Methanol-d_4) δ 8.70 (m, 1H), 8.37 (t, 1H, J = 7.8 Hz), 7.76 (m, 3H), 7.35 (d, 1H, J = 7.8 Hz), 7.24 (d, 1H, J = 7.8 Hz), 6.99 (m, 3H), 6.06 (s, 2H), 4.64 (s, 2H), 2.66 (s, 3H), 2.15 (m, 1H), 2.03 (m, 6H).	522.7
Example 139	4-[4-Benzo[1,3]dioxol-5-yl-5-(6-methyl-pyridin-2-yl)-1H-imidazol-2-yl]-bicyclo[2.2.2]octane-1-carboxylic acid 3-chloro-4-fluoro-benzylamide	(300 MHz, Methanol-d_4) δ 7.34 (t, 1H, J = 7.8 Hz), 7.36 (m, 2H), 7.19 (m, 3H), 6.99 (m, 3H), 6.06 (s, 2H), 4.33 (s, 2H), 2.65 (s, 3H), 2.14 (m, 6H), 1.98 (m, 6H).	573.3
Example 140	4-[4-Benzo[1,3]dioxol-5-yl-5-(6-methyl-pyridin-2-yl)-1H-imidazol-2-yl]-bicyclo[2.2.2]octane-1-carboxylic acid (furan-2-ylmethyl)-amide	(300 MHz, Methanol-d_4) δ 7.73 (t, 1H, J = 7.8 Hz), 7.40 (d, 1H, J = 1.8 Hz), 7.34 (d, 1H, J = 7.8 Hz), 7.23 (d, 1H, J = 7.8 Hz), 6.99 (m, 3H), 6.33 (m, 1H), 6.20 (d, 1H, J = 3.0 Hz), 6.06 (s, 2H), 4.36 (s, 2H), 2.65 (s, 3H), 2.13 (m, 6H), 1.97 (m, 6H).	511.7
Example 141	2-[5-Benzo[1,3]dioxol-5-yl-2-(1-methanesulfonyl-pyrrolidin-3-yl)-3H-imidazol-4-yl]-6-methyl-pyridine	(300 MHz, Methanol-d_4) δ 7.90 (t, 1H, J = 8.1 Hz), 7.42 (m, 2H), 7.03 (m, 3H), 6.07 (s, 2H), 3.86 (m, 2H), 3.66 (m, 2H), 3.52 (m, 1H), 2.97 (s, 3H), 2.66 (s, 3H), 2.44 (m, 2H).	427.4
Example 142	2-{5-Benzo[1,3]dioxol-5-yl-2-[1-(butane-1-sulfonyl)-pyrrolidin-3-yl]-3H-imidazol-4-yl}-6-methyl-pyridine	(300 MHz, Methanol-d_4) δ 7.89 (t, 1H, J = 8.1 Hz), 7.42 (m, 2H), 7.03 (m, 3H), 6.06 (s, 2H), 3.91 (m, 2H), 3.71 (m, 2H), 3.55 (m, 1H), 3.13 (m, 2H), 2.72 (s, 3H), 2.49 (m, 2H), 1.78 (m, 2H), 1.49 (m, 2H), 0.97 (t, 3H, J = 7.5 Hz).	469.5
Example 143	2-{5-Benzo[1,3]dioxol-5-yl-2-[1-(1-methyl-1H-imidazole-4-sulfonyl)-pyrrolidin-3-yl]-3H-imidazol-4-yl}-6-methyl-pyridine	(300 MHz, Methanol-d_4) δ 7.87 (t, 1H, J = 8.1 Hz), 7.78 (s, 1H), 7.77 (s, 1H), 7.40 (m, 2H), 7.02 (m, 3H), 6.07 (s, 2H), 3.96 (m, 1H), 3.77 (s, 3H), 3.67 (m, 3H), 3.48 (m, 1H), 2.66 (s, 3H), 2.30 (m, 2H).	493.5

Example 144	2-[5-Benzo[1,3]dioxol-5-yl-2-(1-phenylmethanesulfonyl-pyrrolidin-3-yl)-3H-imidazol-4-yl]-6-methyl-pyridine	(300 MHz, Methanol-d_4) δ 7.90 (t, 1H, J = 7.8 Hz), 7.41 (m, 8H), 7.02 (m, 3H), 6.07 (s, 2H), 4.46 (s, 2H), 3.62 (m, 5H), 2.71 (s, 3H), 3.45 (m, 2H).	503.5
Example 145	2-{5-Benzo[1,3]dioxol-5-yl-2-[1-(4-chloro-benzenesulfonyl)-pyrrolidin-3-yl]-3H-imidazol-4-yl}-6-methyl-pyridine	(300 MHz, Methanol-d_4) δ 7.87 (m, 3H), 7.59 (m, 2H), 7.41 (m, 2H), 6.99 (m, 3H), 6.07 (s, 2H), 3.82 (m, 1H), 3.60 (m, 3H), 3.44 (m, 1H), 2.72 (s, 3H), 2.36 (m, 2H).	523.02
Example 146	2-{5-Benzo[1,3]dioxol-5-yl-2-[1-(2-nitro-phenylmethanesulfonyl)-piperidin-4-yl]-3H-imidazol-4-yl}-6-methyl-pyridine	(300 MHz, Methanol-d_4) δ 8.07 (d, 1H, J = 8.1 Hz), 7.71 (m, 4H), 7.34 (d, 1H, J = 7.8 Hz), 7.28 (d, 1H, J = 8.1 Hz), 7.02 (m, 3H), 6.07 (s, 2H), 4.92 (s, 2H), 3.81 (m, 2H), 2.65 (m, 1H), 2.97 (m, 2H), 2.65 (s, 3H), 2.15 (m, 2H), 1.98 (m, 2H).	562.5
Example 147	2-{5-Benzo[1,3]dioxol-5-yl-2-[1-(2-naphthalen-2-yl-ethanesulfonyl)-piperidin-4-yl]-3H-imidazol-4-yl}-6-methyl-pyridine	(300 MHz, Methanol-d_4) δ 8.07 (d, 1H, J = 7.8 Hz), 7.90 (d, 1H, J = 8.1 Hz), 7.75 (m, 2H), 7.48 (m, 4H), 7.33 (d, 1H, J = 7.8 Hz), 7.27 (d, 1H, J = 7.8 Hz), 7.02 (m, 3H), 6.07 (s, 2H), 3.99 (m, 2H), 3.58 (m, 2H), 3.43 (m, 2H), 3.30 (m, 1H), 3.01 (m, 2H), 2.64 (s, 3H), 2.18 (m, 2H), 1.97 (m, 2H).	581.6
Example 148	1-{4-[4-Benzo[1,3]dioxol-5-yl-5-(6-methyl-pyridin-2-yl)-1H-imidazol-2-yl]-piperidine-1-sulfonylmethyl}-7,7-dimethyl-bicyclo[2.2.1]heptan-2-one	(300 MHz, Methanol-d_4) δ 7.34 (t, 1H, J = 7.8 Hz), 7.31 (m, 2H), 7.03 (m, 3H), 6.08 (s, 2H), 3.96 (m, 2H), 3.38 (m, 2H), 2.97 (m, 3H), 2.66 (s, 3H), 2.44 (m, 2H), 2.08 (m, 7H), 1.65 (m, 1H), 1.47 (m, 1H), 1.14 (s, 3H), 0.92 (s, 3H).	577.5
Example 149	2-{5-Benzo[1,3]dioxol-5-yl-2-[1-(4-chloro-benzenesulfonyl)-piperidin-4-yl]-3H-imidazol-4-yl}-6-methyl-pyridine	(300 MHz, Methanol-d_4) δ 7.77 (m, 5H), 7.30 (m, 2H), 7.01 (m, 3H), 6.07 (s, 2H), 3.97 (m, 2H), 3.04 (m, 1H), 2.64 (s, 3H), 2.47 (m, 2H), 2.19 (m, 2H), 2.04 (m, 2H).	537.3

Example 150	4-[4-Benzo[1,3]dioxol-5-yl-5-(6-methyl-pyridin-2-yl)-1H-imidazol-2-yl]-bicyclo[2.2.2]octane-1-carboxylic acid methylamide	(300 MHz, Methanol-d_4) δ 7.73 (t, 1H, J = 7.8 Hz), 5.34 (d, 1H, J = 7.8 Hz), 7.23 (d, 1H, J = 7.8 Hz), 6.98 (m, 3H), 6.06 (s, 2H), 2.73 (s, 3H), 2.65 (s, 3H), 2.12 (m, 6H), 1.94 (m, 6H).	445.5
Example 151	4-[4-Benzo[1,3]dioxol-5-yl-5-(6-methyl-pyridin-2-yl)-1H-imidazol-2-yl]-bicyclo[2.2.2]octane-1-carboxylic acid ethylamide	(300 MHz, Methanol-d_4) δ 7.73 (t, 1H, J = 7.8 Hz), 7.34 (d, 1H, J = 7.8 Hz), 7.23 (d, 1H, J = 7.8 Hz), 6.99 (m, 3H), 6.06 (s, 2H), 3.21 (q, 2H, J = 7.2 Hz), 2.65 (s, 3H), 2.13 (m, 6H), 1.95 (m, 6H), 1.11 (t, 3H, J = 7.2 Hz).	459.6
Example 152	4-[4-Benzo[1,3]dioxol-5-yl-5-(6-methyl-pyridin-2-yl)-1H-imidazol-2-yl]-bicyclo[2.2.2]octane-1-carboxylic acid butylamide	(300 MHz, Methanol-d_4) δ 7.73 (t, 1H, J = 7.8 Hz), 7.34 (d, 1H, J = 7.8 Hz), 7.23 (d, 1H, J = 7.8 Hz), 6.99 (m, 3H), 6.06 (s, 2H), 3.19 (t, 2H, J = 6.9 Hz), 2.65 (s, 3H), 2.13 (m, 6H), 1.96 (m, 6H), 1.48 (m, 2H), 1.35 (m, 2H), 0.94 (t, 1H, J = 7.2 Hz).	487.6
Example 153	4-[4-Benzo[1,3]dioxol-5-yl-5-(6-methyl-pyridin-2-yl)-1H-imidazol-2-yl]-bicyclo[2.2.2]octane-1-carboxylic acid isopropylamide	(300 MHz, Methanol-d_4) δ 7.73 (t, 1H, J = 7.8 Hz), 7.34 (d, 1H, J = 7.5 Hz), 7.23 (d, 1H, J = 7.8 Hz), 6.06 (s, 2H), 4.02 (m, 1H), 2.65 (m, 1H), 2.12 (m, 6H), 1.95 (m, 6H), 1.13 (d, 6H, J = 5.4 Hz).	473.6
Example 154	4-[4-Benzo[1,3]dioxol-5-yl-5-(6-methyl-pyridin-2-yl)-1H-imidazol-2-yl]-bicyclo[2.2.2]octane-1-carboxylic acid (3-imidazol-1-yl-propyl)-amide	(300 MHz, Methanol-d_4) δ 8.98 (s, 1H), 7.71 (m, 2H), 7.60 (m, 1H), 7.35 (d, 1H, J = 6.0 Hz), 7.24 (d, 1H, J = 6.0 Hz), 6.99 (m, 3H), 6.06 (s, 2H), 4.26 (t, 2H, J = 6.0 Hz), 4.24 (d, 1H, J = 6.0 Hz), 2.65 (s, 3H), 2.13 (m, 8H), 1.97 (m, 6H).	539.6
Example 155	2-{4-[4-Benzo[1,3]dioxol-5-yl-5-(6-methyl-pyridin-2-yl)-1H-imidazol-2-yl]-piperidine-1-sulfonylmethyl}-phenylamine	(300 MHz, Methanol-d_4) δ 7.74 (t, 1H, J = 7.8 Hz),, 7.29 (m, 4H), 6.99 (m, 5H), 6.06 (s, 2H), 4.44 (s, 2H), 3.89 (m, 2H), 3.22 (m, 1H), 2.97 (m, 2H), 2.66 (s, 3H), 2.13 (m, 2H), 1.94 (m, 2H).	532.3

Example 156	4-[4-Benzo[1,3]dioxol-5-yl-5-(6-methyl-pyridin-2-yl)-1H-imidazol-2-yl]-bicyclo[2.2.2]octane-1-carboxylic acid (1-methyl-5-methylsulfanyl-1H-[1,2,4]triazol-3-yl)-amide	(300 MHz, Methanol-d_4) δ 7.73 (t, 1H, J = 7.8 Hz), 7.35 (d, 1H, J = 7.8 Hz), 7.23 (d, 1H, J = 7.8 Hz), 6.99 (d, 3H, J = 7.8 Hz), 3.70 (s, 3H), 2.65 (s, 3H), 2.07 (m, 12H).	558.6
Example 157	4-[4-Benzo[1,3]dioxol-5-yl-5-(6-methyl-pyridin-2-yl)-1H-imidazol-2-yl]-bicyclo[2.2.2]octane-1-carboxylic acid cyclohexylamide	(300 MHz, Methanol-d_4) δ 7.73 (t, 1H, J = 7.8 Hz), 7.34 (d, 1H, J = 7.8 Hz), 7.23 (d, 1H, J = 7.8 Hz), 6.98 (m, 3H), 6.06 (s, 2H), 3.66 (m, 1H), 2.65 (s, 3H), 2.12 (m, 6H), 1.95 (m, 6H), 1.77 (m, 5H), 1.29 (m, 5H).	513.9
Example 158	{4-[4-Benzo[1,3]dioxol-5-yl-5-(6-methyl-pyridin-2-yl)-1H-imidazol-2-yl]-bicyclo[2.2.2]oct-1-yl}-pyrrolidin-1-yl-methanone	(300 MHz, Methanol-d_4) δ 7.73 (t, 1H, J = 7.8 Hz), 7.34 (d, 1H, J = 7.8 Hz), 7.23 (d, 1H, J = 7.8 Hz), 6.99 (m, 3H), 6.06 (s, 2H), 3.47 (m, 4H), 2.65 (s, 3H), 2.11 (m, 12H), 1.87 (m, 4H).	485.8
Example 159	4-[4-Benzo[1,3]dioxol-5-yl-5-(6-methyl-pyridin-2-yl)-1H-imidazol-2-yl]-bicyclo[2.2.2]octane-1-carboxylic acid dimethylamide	(300 MHz, Methanol-d_4) δ 7.74 (t, 1H, J = 7.8 Hz), 7.35 (d, 1H, J = 7.8 Hz), 7.24 (d, 1H, J = 7.8 Hz), 6.97 (m, 3H), 6.06 (s, 2H), 3.09 (s, 6H), 2.65 (s, 3H), 2.13 (m, 12H).	459.5
Example 160	4-[4-Benzo[1,3]dioxol-5-yl-5-(6-methyl-pyridin-2-yl)-1H-imidazol-2-yl]-bicyclo[2.2.2]octane-1-carboxylic acid diethylamide	(300 MHz, Methanol-d_4) δ 7.73 (m 1H), 7.35 (d, 1H, J = 7.8 Hz), 7.23 (d, 1H, J = 7.8 Hz), 6.99 (m, 3H), 6.06 (s, 2H), 3.47 (m, 4H), 2.65 (s, 3H), 2.10 (m, 12H), 1.17 (m, 6H).	487.4
Example 161	4-[4-Benzo[1,3]dioxol-5-yl-5-(6-methyl-pyridin-2-yl)-1H-imidazol-2-yl]-bicyclo[2.2.2]octane-1-carboxylic acid dipropylamide	(300 MHz, Methanol-d_4) δ 7.73 (t, 1H, J = 8.1 Hz), 7.34 (d, 1H, J = 7.5 Hz), 7.23 (d, 1H, J = 8.1 Hz_, 6.98 (m, 3H), 6.06 (s, 2H), 3.36 (m, 4H), 2.65 (s, 3H), 2.12 (m, 12H), 1.61 (m, 4H), 0.93 (t, 6H, J = 7.2 Hz).	515.5

Example 162	4-[4-Benzo[1,3]dioxol-5-yl-5-(6-methyl-pyridin-2-yl)-1H-imidazol-2-yl]-bicyclo[2.2.2]octane-1-carboxylic acid (5,7-difluoro-benzothiazol-2-yl)-amide	(300 MHz, Methanol-d_4) δ 7.77 (t, 1H, J = 7.8 Hz), 7.50 (m, 1H), 7.37 (d, 1H, J = 7.8 Hz), 7.26 (d, 1H, J = 7.8 Hz), 7.03 (m, 3H), 6.07 (s, 2H), 2.66 (s, 3H), 2.17 (m, 12H).	600.5
Example 163	4-[4-Benzo[1,3]dioxol-5-yl-5-(6-methyl-pyridin-2-yl)-1H-imidazol-2-yl]-bicyclo[2.2.2]octane-1-carboxylic acid benzothiazol-2-ylamide	(300 MHz, Methanol-d_4) δ 7.86 (d, 1H, J = 8.1 Hz), 7.75 (m, 2H), 7.34 (m, 4H), 6.99 (m, 3H), 6.07 (s, 2H), 2.66 (s, 3H), 2.18 (m, 12H).	564.5
Example 164	4-[4-Benzo[1,3]dioxol-5-yl-5-(6-methyl-pyridin-2-yl)-1H-imidazol-2-yl]-bicyclo[2.2.2]octane-1-carboxylic acid (1H-benzoimidazol-2-yl)-amide	(300 MHz, Methanol-d_4) δ 7.78 (t, 1H, J = 7.8 Hz), 7.68 (m, 2H), 7.47 (m, 2H), 7.37 (d, 1H, J = 7.8 Hz), 7.27 (d, 1H, J = 7.8 Hz), 6.99 (m, 3H), 6.07 (s, 2H), 2.67 (s, 3H), 2.21 (m, 12H).	547.5
Example 165	4-[4-Benzo[1,3]dioxol-5-yl-5-(6-methyl-pyridin-2-yl)-1H-imidazol-2-yl]-bicyclo[2.2.2]octane-1-carboxylic acid (2-hydroxy-1-methyl-2-phenyl-ethyl)-amide	(300 MHz, Methanol-d_4) δ 7.73 (t, 1H, J = 7.8 Hz), 7.32 (m, 7H), 6.98 (m, 3H), 6.06 (s, 2H), 4.63 (d, 1H, J = 6.0 Hz), 4.19 (m, 1H), 2.65 (s, 3H), 2.06 (m, 6H), 1.80 (m, 6H), 1.15 (d, 3H, J = 6.6 Hz).	565.5
Example 166	4-[4-Benzo[1,3]dioxol-5-yl-5-(6-methyl-pyridin-2-yl)-1H-imidazol-2-yl]-bicyclo[2.2.2]octane-1-carboxylic acid (pyridin-4-ylmethyl)-amide	(300 MHz, Methanol-d_4) δ 8.79 (d, 2H, J = 6.6 Hz), 7.93 (d, 2H, J = 6.6 Hz), 7.76 (t, 1H, J = 8.1 Hz), 7.36 (d, 1H, J = 7.8 Hz), 7.26 (d, 1H, J = 7.8 Hz), 7.00 (m, 3H), 6.06 (s, 2H), 4.65 (s, 2H), 2.66 (s. 3H), 2.18 (m, 6H), 2.06 (m, 6H).	565.5
Example 167	{4-[4-Benzo[1,3]dioxol-5-yl-5-(6-methyl-pyridin-2-yl)-1H-imidazol-2-yl]-piperidin-1-yl}-(3-chloro-phenyl)-methanone	(300 MHz, Methanol-d_4) δ 7.64 (m, 1H), 7.30 (m, 6H), 6.92 (m, 3H), 5.98 (s, 2H), 3.21 (m, 5H), 2.56 (s, 3H), 1.86 (m, 4H).	501.1

Example 168	{4-[4-Benzo[1,3]dioxol-5-yl-5-(6-methyl-pyridin-2-yl)-1H-imidazol-2-yl]-piperidin-1-yl}-(4-fluoro-phenyl)-methanone	(300 MHz, Methanol-d_4) δ 7.74 (t, 1H, J = 7.8 Hz), 7.51 (m, 2H), 7.27 (m, 4H), 7.03 (m, 3H), 6.08 (s, 2H), 3.89 (m, 2H), 3.42 (m, 1H), 3.11 (m, 2H), 2.66 (s, 3H), 1.94 (m, 4H).	485.5
Example 169	{4-[4-Benzo[1,3]dioxol-5-yl-5-(6-methyl-pyridin-2-yl)-1H-imidazol-2-yl]-piperidin-1-yl}-(4-methoxy-phenyl)-methanone	(300 MHz, Methanol-d_4) δ 7.71 (t, 1H, J = 7.8 Hz), 7.43 (m, 2H), 7.31 (m, 2H), 7.03 (m, 5H), 6.08 (s, 2H), 3.85 (s, 3H), 3.30 (m, 5H), 1.96 (m, 4H).	497.6
Example 170	4-[5-Benzo[1,3]dioxol-5-yl-4-(6-cyclopropyl-pyridin-2-yl)-1H-imidazol-2-yl]-bicyclo[2.2.2]octane-1-carboxylic acid	(300 MHz, Methanol-d_4) δ 7.68 (t, 1H), 7.28 (d, 1H), 7.23 (d, 1H), 7.04-6.95 (m, 3H), 6.07 (s, 2H), 2.20-1.97 (m, 13H), 1.08-0.99 (m, 4H)	458.1
Example 171	4-[5-Benzo[1,3]dioxol-5-yl-4-(6-methyl-pyridin-2-yl)-1H-imidazol-2-yl]-bicyclo[2.2.2]octane-1-carboxylic acid methoxy-amide	(300 MHz, Methanol-d_4) δ 7.73 (t, 1H, J = 8.1 Hz), 7.34 (d, 1H, J = 7.8 Hz), 7.23 (d, 1H, J = 7.8 Hz), 6.98 (m, 3H), 6.05 (s, 2H), 3.67 (s, 3H), 2.64 (s, 3H), 2.11 (m, 6H), 1.94 (m, 6H).	461.3
Example 172	4-[5-Benzo[1,3]dioxol-5-yl-4-(6-methyl-pyridin-2-yl)-1H-imidazol-2-yl]-bicyclo[2.2.2]octane-1-carboxylic acid hydroxyamide	(300 MHz, Methanol-d_4) δ 7.74 (m, 1H), 7.34 (m, 1H), 7.23 (m, 1H), 6.98 (m, 3H), 6.06 (m, 2H), 2.65 (m, 3H), 2.11 (m, 6H), 1.96 (m, 6H).	477.3
Example 173	{4-[4-Benzo[1,3]dioxol-5-yl-5-(6-methyl-pyridin-2-yl)-1H-imidazol-2-yl]-cyclohexylmethyl}-carbamic acid benzyl ester	(300 MHz, Methanol-d_4) δ 7.66 (t, 1H, J = 7.8 Hz), 7.32 (m, 7H), 7.02 (m, 3H), 6.07 (s, 2H), 5.09 (s, 2H), 3.12 (m, 1H), 3.05 (d, 2H, J = 6.6 Hz), 2.62 (s, 3H), 2.17 (m, 2H), 1.98 (m, 2H), 1.74 (m, 2H), 1.62 (m, 1H), 1.18 (m, 2H).	525.3
Example 174	4-[4-Benzo[1,3]dioxol-5-yl-5-(6-methyl-pyridin-2-yl)-1H-imidazol-2-yl]-bicyclo[2.2.2]octane-1-carboxylic acid hydrazide	(300 MHz, Methanol-d_4) δ 7.77 (t, 1H, J = 8.1 Hz), 7.36 (d, 1H, J = 7.5 Hz), 7.26 (d, 1H, J = 7.8 Hz), 7.00 (m, 3H), 6.06 (s, 2H), 2.66 (s, 3H), 2.15 (m, 6H), 2.01 (m, 6H).	446.5

Example 175	N-{4-[4-Benzo[1,3]dioxol-5-yl-5-(6-methyl-pyridin-2-yl)-1H-imidazol-2-yl]-cyclohexylmethyl}-acetamide	(300 MHz, Methanol-d_4) δ 7.67 (t, 1H, J = 7.8 Hz), 7.29 (d, 1H, J = 7.8 Hz), 7.22 (d, 1H, J = 7.8 Hz), 7.02 (m, 3H), 6.08 (s, 2H), 3.09 (m, 3H), 2.66 (m, 1H), 2.63 (s, 3H), 2.18 (m, 2H), 2.01 (m, 1H), 1.96 (s, 3H), 1.75 (m, 2H), 1.64 (m, 1H), 1.19 (m, 2H).	433.5
Example 176	N-{4-[4-Benzo[1,3]dioxol-5-yl-5-(6-methyl-pyridin-2-yl)-1H-imidazol-2-yl]-cyclohexylmethyl}-methanesulfonamide	(300 MHz, Methanol-d_4) δ 7.66 (t, 1H, J = 7.8 Hz), 7.29 (d, 1H, J = 7.8 Hz), 7.22 (d, 1H, J = 7.8 Hz), 7.02 (m, 3H), 6.07 (s, 2H), 2.89 (s, 3H), 2.62 (s, 3H), 2.20 m, 2H), 2.06 (m, 2H), 1.73 (m, 4H), 1.21 (m, 2H).	469.4
Example 177	N-{4-[4-Benzo[1,3]dioxol-5-yl-5-(6-methyl-pyridin-2-yl)-1H-imidazol-2-yl]-cyclohexylmethyl}-C-phenyl-methanesulfonamide	(300 MHz, Methanol-d_4) δ 7.66 (t, 1H, J = 7.8 Hz), 7.35 (m, 8H), 7.02 (m, 2H), 6.07 (s, 2H), 4.33 (s, 2H), 2.83 (d, 1H, J = 6.3 Hz), 2.62 (s, 3H), 2.16 (m, 2H), 1.98 (m, 2H), 1.74 (m, 3H), 1.53 (m, 1H), 1.15 (m, 2H).	545.5
Example 178	Butane-1-sulfonic acid {4-[4-benzo[1,3]dioxol-5-yl-5-(6-methyl-pyridin-2-yl)-1H-imidazol-2-yl]-cyclohexylmethyl}-amide	(300 MHz, Methanol-d_4) δ 7.67 (m, 1H), 7.29 (d, 1H, J = 7.8 Hz), 7.22 (d, 1H, J = 7.8 Hz), 7.02 (m, 1H), 6.07 (s, 2H), 3.05 (m, 3H), 2.96 (d, 1H, J = 6.3 Hz), 2.63 (s, 3H), 2.20 (m, 2H), 2.06 (m, 2H), 1.75 (m, 4H), 1.63 (m, 1H), 1.49 (m, 2H), 1.20 (m, 2H), 0.98 (t, 3H, J = 6.3 Hz).	511.3
Example 179	Propane-2-sulfonic acid {4-[4-benzo[1,3]dioxol-5-yl-5-(6-methyl-pyridin-2-yl)-1H-imidazol-2-yl]-cyclohexylmethyl}-amide	(300 MHz, Methanol-d_4) δ 7.68 (m, 1H), 7.29 (d, 1H, J = 8.1 Hz), 7.22 (d, 1H, J = 7.8 Hz), 7.03 (m, 3H), 6.07 (s, 2H), 3.22 (m, 1H), 3.09 (m, 1H), 2.99 (d, 2H, J = 6.3 Hz), 2.63 (s, 3H), 2.20 (m, 2H), 2.06 (m, 2H), 1.76 (m, 2H), 1.62 (m, 1H), 1.34 (d, 6H, J = 6.6 Hz), 1.20 (m, 2H).	497.3
Example 180	N-{4-[4-Benzo[1,3]dioxol-5-yl-5-(6-methyl-pyridin-2-yl)-1H-imidazol-2-yl]-cyclohexylmethyl}-C-pyridin-2-yl-methanesulfonamide	(300 MHz, Methanol-d_4) δ 8.64 (m, 1H), 8.00 (m, 1H), 7.66 (m, 2H), 7.54 (m, 1H), 7.29 (d, 1H, J = 7.5 Hz), 7.21 (d, 1H, J = 8.1 Hz), 7.01 (m, 3H), 6.07 (s, 2H), 4.56 (s, 2H), 3.08 (m, 1H), 2.95 (d, 2H, J = 6.6 Hz), 2.62 (s, 3H), 2.19 (m, 2H), 2.00 (m, 2H), 1.73 (m, 2H), 1.60 (m, 1H), 1.19 (m, 2H).	546.3

Example 181	N-{4-[4-Benzo[1,3]dioxol-5-yl-5-(6-methyl-pyridin-2-yl)-1H-imidazol-2-yl]-cyclohexylmethyl}-C-pyridin-4-yl-methanesulfonamide	(300 MHz, Methanol-d_4) δ 8.76 (d, 2H, J = 6.3 Hz), 7.90 (d, 2H, J = 6.3 Hz), 7.67 (t, 1H, J = 7.8 Hz), 7.29 (d, 1H, J = 7.8 Hz), 7.22 (d, 1H, J = 7.8 Hz), 7.02 (m, 3H), 6.07 (s, 2H), 4.60 (s, 2H), 3.12 (m, 1H), 3.01 (d, 1H, J = 6.6 Hz), 2.20 (m, 2H), 2.04 (m, 2H), 1.73 (m, 2H), 1.62 (m, 1H), 1.17 (m, 2H).	546.3
Example 182	(4-Methoxy-benzyl)-{4-[5-(6-methyl-pyridin-2-yl)-2-(1-phenylmethanesulfonyl-piperidin-4-yl)-1H-imidazol-4-yl]-pyridin-2-yl}-amine	(400MHz, Methanol-d4), δ 8.23 (d, 1H), 7.87 (t, 1H), 7.47-7.31 (m, 10H), 7.06 (d, 1H), 7.01 (s, 1H), 6.89 (d, 1H), 4.38 (s, 2H), 3.95 (s, 3H), 3.78 (m, 5H), 2.86 (t, 2H), 2.66 (m, 3H), 2.10 (d, 2H), 1.97 (m, 2H)	609.5
Example 183	4-[5-(6-Methyl-pyridin-2-yl)-4-[1,2,4]triazolo[1,5-a]pyridin-6-yl-1H-imidazol-2-yl]-bicyclo[2.2.2]octane-1-carboxylic acid methyl ester	(300 MHz, Methanol-d_4) δ 9.27 (s, 1H), 8.57 (s, 1H), 7.93 (d, 1H), 7.86 (t, 1H), 7.80 (dd, 1H), 7.45 (dd, 1H), 7.31 (d, 1H), 3.72 (s, 3H), 2.22-2.15 (m, 6H), 2.05-1.97 (m, 6H)	443.3
Example 184	4-[5-(6-Methyl-pyridin-2-yl)-4-[1,2,4]triazolo[1,5-a]pyridin-6-yl-1H-imidazol-2-yl]-bicyclo[2.2.2]octane-1-carboxylic acid	(300 MHz, Methanol-d_4) δ 9.27 (s, 1H), 8.57 (s, 1H), 7.93 (d, 1H), 7.86 (t, 1H), 7.81 (dd, 1H), 7.44 (d, 1H), 7.31 (d, 1H), 2.22-2.15 (m, 6H), 2.05-1.97 (m, 6H)	429.1
Example 185	4-[4-(6-Cyclopropyl-pyridin-2-yl)-5-[1,2,4]triazolo[1,5-a]pyridin-6-yl-1H-imidazol-2-yl]-bicyclo[2.2.2]octane-1-carboxylic acid methyl ester	(300 MHz, Methanol-d_4) δ 9.19 (s, 1H), 8.57 (s, 1H), 7.93 (d, 1H), 7.79 (dd, 1H), 7.76 (t, 1H), 7.46 (d, 1H), 7.31 (d, 1H), 3.72 (s, 3H), 2.22-2.03 (m, 13H), 0.92-0.87 (m, 2H), 0.72-0.69 (m, 2H)	469.3
Example 186	4-[4-(6-Methyl-pyridin-2-yl)-5-[1,2,4]triazolo[1,5-a]pyridin-6-yl-1H-imidazol-2-yl]-bicyclo[2.2.2]octane-1-carboxylic acid hydroxyamide	(300 MHz, Methanol-d_4) δ 9.26 (s, 1H), 8.57 (s, 1H), 7.93 (d, 1H), 7.86 (t, 1H), 7.80 (dd, 1H), 7.44 (dd, 1H), 7.31 (d, 1H), 3.72 (s, 3H), 2.22-2.15 (m, 13H), 2.05-1.95 (m, 6H)	429.3
Example 187	4-[4-(6-Methyl-pyridin-2-yl)-5-[1,2,4]triazolo[1,5-a]pyridin-6-yl-1H-imidazol-2-yl]-bicyclo[2.2.2]octane-1-carboxylic acid amide	(300 MHz, Methanol-d_4) δ 9.27 (s, 1H), 8.57 (s, 1H), 7.93 (d, 1H), 7.86 (t, 1H), 7.80 (dd, 1H), 7.45 (dd, 1H), 7.31 (d, 1H), 3.72 (s, 3H), 2.22-2.15 (m, 13H), 2.05-1.95 (m, 6H)	428.3

Example 188	4-[4-(6-Cyclopropyl-pyridin-2-yl)-5-[1,2,4]triazolo[1,5-a]pyridin-6-yl-1H-imidazol-2-yl]-bicyclo[2.2.2]octane-1-carboxylic acid	(300 MHz, Methanol-d_4) δ 9.19 (s, 1H), 8.57 (s, 1H), 7.93 (d, 1H), 7.79 (dd, 1H), 7.76 (t, 1H), 7.46 (d, 1H), 7.31 (d, 1H), 2.20-2.03 (m, 13H), 0.93-0.87 (m, 2H), 0.73-0.69 (m, 2H)	455.4
Example 189	N-{4-[4-Benzo[1,3]dioxol-5-yl-5-(6-methyl-pyridin-2-yl)-1H-imidazol-2-yl]-bicyclo[2.2.2]oct-1-yl}-2,2,2-trifluoro-acetamide	(300 MHz, Methanol-d_4) δ 8.60 (s, 1H), 7.76 (t, 1H, J = 7.8 Hz), 7.36 (d, 1H, J = 7.8 Hz), 7.25 (d, 1H, J = 7.8 Hz), 7.02 (m, 3H), 6.06 (s, 2H), 2.66 (s, 3H), 2.19 (m, 12H).	499.2
Example 190	4-[4-Benzo[1,3]dioxol-5-yl-5-(6-methyl-pyridin-2-yl)-1H-imidazol-2-yl]-bicyclo[2.2.2]octan-1-ol	(300 MHz, Methanol-d_4) δ 7.72 (t, 1H, J = 7.8 Hz), 7.34 (d, 1H, J = 7.5 Hz), 7.22 (d, 1H, J = 7.5 Hz), 6.98 (m, 3H), 6.06 (s, 2H), 2.64 (s, 3H), 2.21 (m, 6H), 1.83 (m, 6H).	404.4
Example 191	4-[4-(6-Cyclopropyl-pyridin-2-yl)-5-[1,2,4]triazolo[1,5-a]pyridin-6-yl-1H-imidazol-2-yl]-bicyclo[2.2.2]octane-1-carboxylic acid amide	(300 MHz, Methanol-d_4) δ 9.20 (s, 1H), 8.57 (s, 1H), 7.93 (d, 1H), 7.79 (dd, 1H), 7.76 (t, 1H), 7.47 (d, 1H), 7.31 (d, 1H), 2.23-2.00 (m, 13H), 0.91-0.88 (m, 2H), 0.71-0.68 (m, 2H)	454.3
Example 192	4-[4-(6-Cyclopropyl-pyridin-2-yl)-5-[1,2,4]triazolo[1,5-a]pyridin-6-yl-1H-imidazol-2-yl]-bicyclo[2.2.2]octane-1-carboxylic acid hydroxyamide	(300 MHz, Methanol-d_4) δ 9.19 (s, 1H), 8.57 (s, 1H), 7.93 (d, 1H), 7.79 (dd, 1H), 7.76 (t, 1H), 7.46 (d, 1H), 7.32 (d, 1H), 2.23-1.99 (m, 13H), 0.92-0.87 (m, 2H), 0.73-0.69 (m, 2H)	470.2
Example 193	N-{4-[5-Benzo[1,3]dioxol-5-yl-4-(6-methyl-pyridin-2-yl)-1H-imidazol-2-yl]-bicyclo[2.2.2]oct-1-yl}-sulfamide	(300 MHz, Methanol-d_4) δ 7.75 (m, 1H), 7.34 (m, 1H), 7.23 (m, 1H), 6.98 (m, 3H), 6.06 (s, 2H), 2.65 (s, 3H), 2.15 (m, 12H).	482.4
Example 194	Sulfamic acid 4-[4-benzo[1,3]dioxol-5-yl-5-(6-methyl-pyridin-2-yl)-1H-imidazol-2-yl]-bicyclo[2.2.2]oct-1-yl ester	(300 MHz, Methanol-d_4) δ 7.74 (t, 1H, J = 8.1 Hz), 7.36 (d, 1H, J = 7.5 Hz), 7.25 (d, 1H, J = 7.8 Hz), 6.98 (m, 3H), 6.06 (s, 2H), 2.66 (s, 3H), 2.29 (m, 12H).	483.4
Example 195	{4-[4-(6-Methyl-pyridin-2-yl)-5-quinoxalin-6-yl-1H-imidazol-2-yl]-cyclohexyl}-carbamic acid benzyl ester	(300 MHz, Methanol-d_4) δ 8.98 (m, 2H), 8.38 (m, 1H), 8.23 (d, 1H, J = 8.7 Hz), 7.96 (m, 1H), 7.73 (m, 1H), 7.30 (m, 7H), 5.09 (s, 2H), 3.55 (m, 1H), 3.14 (m, 1H), 2.63 (s, 3H), 2.07 (m, 6H), 1.48 (m, 2H).	519.3

Example 196	N-{4-[4-Benzo[1,3]dioxol-5-yl-5-(6-methyl-pyridin-2-yl)-1H-imidazol-2-yl]-bicyclo[2.2.2]octane-1-carbonyl}-methanesulfonamide	(300 MHz, Methanol-d_4) δ 7.75 (t, 1H, J = 7.8 Hz), 7.36 (d, 1H, J = 7.5 Hz), 7.24 (d, 1H, J = 7.8 Hz), 6.98 (m, 3H), 6.09 (s, 2H), 3.25 (s, 3H), 2.66 (s, 3H), 2.13 (m, 6H), 2.01 (m, 6H).	509.4
Example 197	N-{4-[4-Benzo[1,3]dioxol-5-yl-5-(6-methyl-pyridin-2-yl)-1H-imidazol-2-yl]-bicyclo[2.2.2]octane-1-carbonyl}-benzenesulfonamide	(300 MHz, Methanol-d_4) δ 8.01 (m, 2H), 7.72 (m, 2H), 7.59 (m, 2H), 7.35 (d, 1H, J = 7.5 Hz), 7.23 (d, 1H, J = 7.8 Hz), 6.97 (m, 3H), 6.06 (s, 2H), 2.65 (s, 3H), 2.08 (m, 6H), 1.89 (m, 6H).	571.3
Example 198	4-[5-(3-Methyl-4-oxo-3,4-dihydro-quinazolin-6-yl)-4-(6-methyl-pyridin-2-yl)-1H-imidazol-2-yl]-bicyclo[2.2.2]octane-1-carboxylic acid methyl ester	(300 MHz, Methanol-d_4) δ 8.50 (d, 1H), 8.47 (s, 1H), 7.95 (d, 1H), 7.82 (d, 1H), 7.80 (t, 1H), 7.43 (d, 1H), 7.31 (d, 1H), 3.72 (s, 3H), 3.65 (s, 3H), 2.67 (s, 3H), 2.22-2.16 (m, 6H), 2.07-2.01 (m, 6H)	484.3
Example 199	4-[5-(3-Methyl-4-oxo-3,4-dihydro-quinazolin-6-yl)-4-(6-methyl-pyridin-2-yl)-1H-imidazol-2-yl]-bicyclo[2.2.2]octane-1-carboxylic acid	(300 MHz, Methanol-d_4) δ 8.51 (d, 1H), 8.48 (s, 1H), 7.96 (d, 1H), 7.84-7.77 (m, 2H), 7.44 (d, 1H), 7.32 (d, 1H), 3.65 (s, 3H), 2.69 (s, 3H), 2.22-2.16 (m, 6H), 2.07-2.01 (m, 6H)	470.3
Example 200	N-{4-[4-(6-Methyl-pyridin-2-yl)-5-quinoxalin-6-yl-1H-imidazol-2-yl]-cyclohexyl}-acetamide	(300 MHz, Methanol-d_4) δ 8.98 (m, 2H), 8.38 (d, 1H, J = 2.1 Hz), 8.23 (d, 1H, J = 8.7 Hz), 7.97 (m, 1H), 7.72 (t, 1H, J = 7.8 Hz), 7.35 (m, 2H), 3.81 (m, 1H), 3.16 (m, 1H), 2.65 (s, 3H), 2.27 (m, 2H), 2.14 (m, 2H), 1.99 (s, 3H), 1.88 (m, 2H), 1.46 (m, 2H).	427.3
Example 201	4-[4-(6-Methyl-pyridin-2-yl)-5-quinoxalin-6-yl-1H-imidazol-2-yl]-bicyclo[2.2.2]octane-1-carboxylic acid methyl ester	(300 MHz, Methanol-d_4) δ 8.87 (d, 2H, J = 0.6 Hz), 8.24 (d, 2H, J = 1.8 Hz), 8.10 (d, 1H, J = 9.0 Hz), 7.82 (m, 1H), 7.67 (t, 1H, J = 7.8 Hz), 7.31 (d, 1H, J = 7.8 Hz), 7.21 (d, 1H, J = 7.8 Hz), 3.59 (s, 3H), 2.55 (s, 3H), 2.07 (m, 6H), 1.92 (m, 6H).	454.3
Example 202	4-[4-(6-Methyl-pyridin-2-yl)-5-quinoxalin-6-yl-1H-imidazol-2-yl]-bicyclo[2.2.2]octane-1-carboxylic acid	(300 MHz, Methanol-d_4) δ 8.98 (m, 2 H), 8.34 (m, 1H), 8.21 (d, 1H, J = 8.7 Hz), 7.92 (m, 1H), 7.77 (t, 1H, J = 7.8 Hz), 7.39 (d, 1H, J = 7.5 Hz), 7.31 (d, 1H, J = 7.8 Hz), 2.65 (s, 3H), 2.18 (m, 6H), 2.04 (m, 6H).	440.3

Example 203	4-[4-(6-Methyl-pyridin-2-yl)-5-quinoxalin-6-yl-1H-imidazol-2-yl]-bicyclo[2.2.2]octane-1-carboxylic acid hydroxyamide	(300 MHz, Methanol-d_4) δ 8.96 (m, 2H), 8.34 (d, 1H, J = 1.8 Hz), 8.21 (d, 1H, J = 8.7 Hz), 7.92 (m, 1H), 7.78 (t, 1H, J = 7.8 Hz), 7.42 (d, 1H, J = 7.8 Hz), 7.32 (d, 1H, J = 7.8 Hz), 2.18 (m, 6H), 2.00 (m, 6H).	455.3
Example 204	4-[4-(6-Methyl-pyridin-2-yl)-5-quinoxalin-6-yl-1H-imidazol-2-yl]-bicyclo[2.2.2]octane-1-carboxylic acid amide	(300 MHz, Methanol-d_4) δ 8.97 (m, 2H), 8.34 (d, 1H, J = 1.8 Hz), 8.21 (d, 1H, J = 9.0 Hz), 7.92 (m, 1H), 7.77 (t, 1H, J = 7.8 Hz), 7.42 (d, 1H, J = 7.8 Hz), 7.31 (d, 1H, J = 7.8 Hz).	439.3
Example 205	N-{4-[4-(6-Methyl-pyridin-2-yl)-5-quinoxalin-6-yl-1H-imidazol-2-yl]-cyclohexyl}-methanesulfonamide	(300 MHz, Methanol-d_4) δ 8.98 (m, 2H), 8.37 (d, 1H, J = 1.8 Hz), 8.24 (d, 1H, J = 8.7 Hz), 7.96 (m, 1H), 7.73 (t, 1H, J = 7.8 Hz), 7.38 (d, 1H, J = 7.8 Hz), 7.30 (d, 1H, J = 7.8 Hz), 3.80 (m, 1H), 3.12 (m, 1H), 2.98 (s, 3H), 2.65 (s, 3H), 2.27 (m, 2H), 1.90 (m, 2H), 1.56 (m, 2H).	463.3
Example 206	2,2,2-Trifluoro-N-{4-[4-(6-methyl-pyridin-2-yl)-5-quinoxalin-6-yl-1H-imidazol-2-yl]-cyclohexyl}-acetamide	(300 MHz, Methanol-d_4) δ 8.98 (m, 2H), 8.38 (d, 1H, J = 1.8 Hz), 8.24 (d, 1H, J = 8.7 Hz), 7.97 (m, 1H), 7.76 (t, 1H, J = 7.8 Hz), 7.38 (d, 1H, J = 7.8 Hz), 7.31 (d, 1H, J = 7.8 Hz).	481.2
Example 207	4-[4-(5-Fluoro-6-methyl-pyridin-2-yl)-5-[1,2,4]triazolo[1,5-a]pyridin-6-yl-1H-imidazol-2-yl]-bicyclo[2.2.2]octane-1-carboxylic acid methyl ester	(300 MHz, Methanol-d_4) δ 9.29 (s, 1H), 8.57 (d, 1H), 7.93 (dd, 1H), 7.81 (dt, 1H), 7.56 (td, 1H), 7.45 (m, 1H), 3.72 (d, 3H), 2.56 (t, 3H), 2.23-2.18 (m, 6H), 2.08-2.04 (m, 6H)	461.5
Example 208	{4-[2-[1-(Butane-1-sulfonyl)-piperidin-4-yl]-5-(6-methyl-pyridin-2-yl)-1H-imidazol-4-yl]-pyridin-2-yl}-(4-methoxy-benzyl)-amine	(400MHz, Methanol-d4), δ 7.82 (d, 1H), 7.66 (t, 1H), 7.30 (d, 1H), 7.23-7.18 (m, 3H), 6.85 (m, 2H), 6.81 (s, 1H), 6.78 (dd, 1H), 4.36 (s, 2H), 3.85 (d, 2H), 3.76 (s, 3H), 3.05-2.93 (m, 5H), 2.53 (s, 3H), 2.08 (d, 2H), 1.94 (ddd, 2H), 1.76 (m, 2H), 1.48 (m, 2H), 0.97 (t, 3H)	575.3

Example 209	4-[2-[1-(Butane-1-sulfonyl)-piperidin-4-yl]-5-(6-methyl-pyridin-2-yl)-1H-imidazol-4-yl]-pyridin-2-ylamine	(400MHz, Methanol-d4), δ 7.81 (d, 1H), 7.65 (t, 1H), 7.30 (d, 1H), 7.19 (d, 1H), 6.76 (s, 1H), 6.68 (dd, 1H), 4.36 (s, 2H), 3.84 (d, 2H), 3.34 (s, 2H), 3.04-2.92 (m, 5H), 2.52 (s, 3H), 2.06 (d, 2H), 1.94 (m, 2H), 1.76 (m, 2H), 1.48 (m, 2H), 0.97 (t, 3H)	455.1
Example 210	2-[5-Benzo[1,3]dioxol-5-yl-2-(1-phenylmethanesulfonyl-piperidin-4-yl)-3H-imidazol-4-yl]-6-ethyl-pyridine	1HNMR (400MHz, Methanol-d4), δ 7.77 (t, 1H), 7.54-7.42 (m, 6H), 7.37 (d, 1H), 7.31 (d, 1H), 7.08-7.00 (m, 3H), 6.09 (s, 2H), 4.42 (s, 2H), 3.85 (d, 2H), 3.25 (m, 1H), 2.94 (q, 2H), 2.87 (dt, 2H), 2.15 (m, 2H), 1.94 (ddd, 2H), 1.37 (t, 3H)	531.5
Example 211	4-[5-(3-Methyl-4-oxo-3,4-dihydro-quinazolin-6-yl)-4-(6-methyl-pyridin-2-yl)-1H-imidazol-2-yl]-bicyclo[2.2.2]octane-1-carboxylic acid amide	1HNMR (300MHz, Methanol-d4), δ 8.50 (d, 1H), 8.45 (s, 1H), 7.95 (dd, 1H), 7.83-7.77 (m, 2H), 7.43 (d, 1H), 7.32 (d, 1H), 3.65 (s, 3H), 2.68 (s, 3H), 2.23-2.18 (m, 6H), 2.05-2.00 (m, 6H),	469.3
Example 212	4-[5-(3-Methyl-4-oxo-3,4-dihydro-quinazolin-6-yl)-4-(6-methyl-pyridin-2-yl)-1H-imidazol-2-yl]-bicyclo[2.2.2]octane-1-carboxylic acid hydroxyamide	1H NMR (400 MHz, Methanol-d4): δ 8.46 (d, 1H), 8.39 (s, 1H), 7.91 (dd, 1H), 7.77 (m, 2H), 7.39 (d, 1H), 7.27 (d, 1H), 3.62 (s, 3H), 2.66 (s, 3H), 2.16 (m, 6H), 1.98 (m, 6H).	485.4
Example 213	N-{4-[5-(6-Methyl-pyridin-2-yl)-4-quinoxalin-6-yl-1H-imidazol-2-yl]-bicyclo[2.2.2]oct-1-yl}-methanesulfonamide	1H NMR (400 MHz, Methanol-d4): δ 8.97 (m, 2H), 8.33 (m, 1H), 8.20 (d, 1H), 7.92 (m, 1H), 7.77 (t, 1H), 7.41 (d, 1H), 7.31 (d, 1H), 2.65 (s, 3H), 2.23 (m, 6H), 2.14 (m, 6H), 1.90 (s, 3H).	453.6
Example 214	N-{4-[5-(6-Methyl-pyridin-2-yl)-4-quinoxalin-6-yl-1H-imidazol-2-yl]-bicyclo[2.2.2]oct-1-yl}-acetamide	1H NMR (400 MHz, Methanol-d4): δ 8.97 (m, 2H), 8.33 (m, 1H), 8.21 (d, 1H), 7.91 (m, 1H), 7.79 (t, 1H), 7.42 (m, 1H), 7.32 (m, 1H), 3.02 (s, 3H), 2.63 (s, 3H), 2.24 (m, 6H), 2.13 (m, 6H).	489.5

The TGFβ inhibitory activity of compounds of formula (I) can be assessed by methods described in the following examples.

Example 215

Cell-Free Assay for Evaluating Inhibition of Autophosphorylation of TGFβ Type I Receptor

The serine-threonine kinase activity of TGFβ type I receptor was measured as the autophosphorylation activity of the cytoplasmic domain of the receptor containing an N-terminal poly histidine, TEV cleavage site-tag, e.g., His-TGFβRI. The His-tagged receptor cytoplasmic kinase domains were purified from infected insect cell cultures using the Gibco-BRL FastBac HTb baculovirus expression system.

To a 96-well Nickel FlashPlate (NEN Life Science, Perkin Elmer) was added 20 µl of 1.25 µCi ^{33}P-ATP/25 µM ATP in assay buffer (50 mM Hepes, 60 mM NaCl, 1 mM $MgCl_2$, 2 mM DTT, 5 mM $MnCl_2$, 2% glycerol, and 0.015% Brij® 35). 10 µl of each test compound of formula (I) prepared in 5% DMSO solution were added to the FlashPlate. The assay was then initiated with the addition of 20 ul of assay buffer containing 12.5 pmol of His-TGFβRI to each well. Plates were incubated for 30 minutes at room temperature and the reactions were then terminated by a single rinse with TBS. Radiation from each well of the plates was read on a TopCount (Packard). Total binding (no inhibition) was defined as counts measured in the presence of DMSO solution containing no test compound and non-specific binding was defined as counts measured in the presence of EDTA or no-kinase control.

Alternatively, the reaction performed using the above reagents and incubation conditions but in a microcentrifuge tube was analyzed by separation on a 4-20% SDS-PAGE gel and the incorporation of radiolabel into the 40 kDa His-TGFβRI SDS-PAGE band was quantitated on a Storm Phosphoimager (Molecular Dynamics).

Compounds of formula (I) typically exhibited IC_{50} values of less than 10 µM; some exhibited IC_{50} values of less than 1 µM; and some even exhibited IC_{50} values of less than 50 nM.

Example 216

Cell-Free Assay for Evaluating Inhibition of Activin Type I Receptor Kinase Activity

Inhibition of the Activin type I receptor (Alk 4) kinase autophosphorylation activity by test compounds of formula (I) can be determined in a similar manner to that described

above in Example 215 except that a similarly His-tagged form of Alk 4 (His-Alk 4) is used in place of the His-TGFβRI.

Example 217

TGFβ Type I Receptor Ligand Displacement FlashPlate Assay

50 nM of tritiated 4-(3-pyridin-2-yl-1H-pyrazol-4-yl)-quinoline (custom-ordered from PerkinElmer Life Science, Inc., Boston, MA) in assay buffer (50 mM Hepes, 60 mM $NaCl_2$, 1 mM $MgCl_2$, 5 mM $MnCl_2$, 2 mM 1,4-dithiothreitol (DTT), 2% Brij® 35; pH 7.5) was premixed with a test compound of formula (I) in 1% DMSO solution in a v-bottom plate. Control wells containing either DMSO without any test compound or control compound in DMSO were used. To initiate the assay, His-TGFβ Type I receptor in the same assay buffer (Hepes, $NaCl_2$, $MgCl_2$, $MnCl_2$, DTT, and 30% Brij® added fresh) was added to a nickel coated FlashPlate (PE, NEN catalog number: SMP107), while the control wells contained only buffer (i.e., no His-TGFβ Type I receptor). The premixed solution of tritiated 4-(3-pyridin-2-yl-1H-pyrazol-4-yl)-quinoline and test compound of formula (I) was then added to the wells. The wells were aspirated after an hour at room temperature and radioactivity in wells (emitted from the tritiated compound) was measured using TopCount (PerkinElmer Lifesciences, Inc., Boston MA).

Compounds of formula (I) typically exhibited K_i values of less than 10 μM; some exhibited K_i values of less than 1 μM; and some even exhibited K_i values of less than 50 nM.

Example 218

Assay for Evaluating Cellular Inhibition of TGFβ Signaling and Cytotoxicity

Biological activity of the compounds of formula (I) was determined by measuring their ability to inhibit TGFβ-induced PAI-Luciferase reporter activity in HepG2 cells.

HepG2 cells were stably transfected with the PAI-luciferase reporter grown in DMEM medium containing 10% FBS, penicillin (100 U/ml), streptomycin (100 μg/ml), L-glutamine (2 mM), sodium pyruvate (1 mM), and non-essential amino acids (1x). The transfected cells were then plated at a concentration of 2.5 x 10^4 cells/well in 96 well plates and starved for 3-6 hours in media with 0.5% FBS at 37°C in a 5% CO_2 incubator. The

cells were then stimulated with 2.5 ng/ml TGFβ ligand in the starvation media containing 1% DMSO either in the presence or absence of a test compound of formula (I) and incubated as described above for 24 hours. The media was washed out the following day and the luciferase reporter activity was detected using the LucLite Luciferase Reporter Gene Assay kit (Packard, cat. no. 6016911) as recommended. The plates were read on a Wallac Microbeta plate reader, the reading of which was used to determine the IC_{50} values of compounds of formula (I) for inhibiting TGFβ-induced PAI-Luciferase reporter activity in HepG2 cells. Compounds of formula (I) typically exhibited IC_{50} values of less 10 uM.

Cytotoxicity was determined using the same cell culture conditions as described above. Specifically, cell viability was determined after overnight incubation with the CytoLite cell viability kit (Packard, cat. no. 6016901). Compounds of formula (I) typically exhibited LD_{25} values greater than 10 μM.

Example 219

Assay for Evaluating Inhibition of TGFβ Type I Receptor Kinase Activity in Cells

The cellular inhibition of activin signaling activity by the test compounds of formula (I) is determined in a similar manner as described above in Example 218 except that 100 ng/ml of activin is added to serum starved cells in place of the 2.5 ng/ml TGFβ.

Example 220

Assay for TGFβ-Induced Collagen Expression

Preparation of Immortalized Collagen Promotor-Green Fluorescent Protein Cells

Fibroblasts are derived from the skin of adult transgenic mice expressing Green Fluorescent Protein (GFP) under the control of the collagen 1A1 promoter (see Krempen, K. et al., Gene Exp. 8: 151-163 (1999)). Cells are immortalized with a temperature sensitive large T antigen that is in an active stage at 33°C. Cells are expanded at 33°C and then transferred to 37°C at which temperature the large T antigen becomes inactive (see Xu, S. et al., Exp. Cell Res. 220: 407-414 (1995)). Over the course of about 4 days and one split, the cells cease proliferating. Cells are then frozen in aliquots sufficient for a single 96 well plate.

Assay of TGFβ-induced Collagen-GFP Expression

Cells are thawed, plated in complete DMEM (contains non-essential amino acids, 1mM sodium pyruvate and 2mM L-glutamine) with 10 % fetal calf serum, and then incubated for overnight at 37°C, 5% CO_2. The cells are trypsinized in the following day and transferred into 96 well format with 30,000 cells per well in 50 µl complete DMEM containing 2 % fetal calf serum, but without phenol red. The cells are incubated at 37°C for 3 to 4 hours to allow them to adhere to the plate. Solutions containing a test compound of formula (I) are then added to wells with no TGFβ (in triplicates), as well as wells with 1 ng/ml TGFβ (in triplicates). DMSO is also added to all of the wells at a final concentration of 0.1%. GFP fluorescence emission at 530 nm following excitation at 485 nm is measured at 48 hours after the addition of solutions containing a test compound on a CytoFluor microplate reader (PerSeptive Biosystems). The data are then expressed as the ratio of TGFβ-induced to non-induced for each test sample.

Other Embodiments

It is to be understood that while the invention has been described in conjunction with the detailed description thereof, the foregoing description is intended to illustrate and not limit the scope of the invention, which is defined by the scope of the appended claims. Other aspects, advantages, and modifications are within the scope of the following claims.